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Buying Out Supply Companies

WITH the object of developing the more sparsely populated territories electrically, a new type of undertaking was called into being by a section of the Act of 1926. This was what the first Weir Report termed a "supply company."

The function of these organisations was to serve large areas not already covered by power companies, from which they differed broadly by possessing the right to provide electricity for any purpose and by holding statutory powers for a limited period instead of in perpetuity. Provision was also made to relate prices for energy sold to divisible profits.

In the limitation of its tenure to fifty years the supply company resembles the older form of Special Order company, which has a secured life of forty-two years, but, unlike the latter, its area must extend throughout the districts of at least two local authorities. Fortunately, its area cannot be broken up at the expiry of the franchise, as purchase rights for the whole undertaking are vested in a Joint Electricity Authority or in a joint board of all the undertakings concerned.

Terms of purchase of a supply company provide for the refund of capital expenditure on plant suitable for use at the time of transfer less depreciation. The scale of depreciation is the subject of a Special Order that has now been drafted by the Electricity Commissioners. It differs in many respects from an earlier official scale employed in calculating the addition that may be made to the grid tariff by one undertaking giving an indirect supply in bulk to another in respect of the use of its high-voltage transmission system for the purpose.

Transformers of more than 100 kVA rating, for example, are given a longer life than formerly; the same applies to distribution switchgear and overhead lines. As some of these items might be employed in connection with the furnishing of bulk supplies, the requisite adjustments between the two scales seem likely to introduce difficulties when the time comes for handing over the undertaking as a going concern.

The new Special Order has no reference to the larger questions of policy involved in limited tenures. These may often prove detrimental to the ultimate interests of consumers, since, to take one example, a supply company might be expected, in the last few years of possession, to be not over-anxious to acquire new load if that meant the supersession of any part of its distribution system, as such part would not then be recognised as a purchasable asset. Also it is intended to serve an area that needs time for development.

It is now generally realised that the progress of electricity supply was handicapped at the outset by the short life of twenty-one years originally secured to a company in 1882; this was far too little a time in which to enable the losses inevitable in the early stages to be recouped later. Even the subsequent doubling of the period of tenure failed to encourage private enterprise, since the local authority was entitled to take over only the physical assets which were ready for immediate working—and that at what might be deemed their fair market value, without allowance for goodwill or the natural anticipation of future benefits accruing from a policy of active development.

The consequences of this may be seen in the unfavourable comparisons that are sometimes drawn between the records of small single-area companies and of power companies which, unharassed by uncertainty for the future, can afford to take long views.

An opportunity was lost in the 1926 Act for devising conditions under which supply companies could be transferred ultimately to public ownership, if that were believed to be desirable, without adversely affecting consumers.

The new scale of depreciation, which is a matter of administrative detail, cannot be expected to be helpful in straightening out a legislative position that has been one of the factors that have always hampered the supply of electricity.

What's in a Name?

THE according of an adequate status to engineering is much more than a matter of the dignity naturally desired by members of a socially useful group of professions. The qualifications and training required must be recognised by the public also if the engineer is to be allowed full scope for putting the achievements of science to practical use. Although the public may ignorantly ascribe functions to him that are merely those of the mechanic, the position would not, surely, be bettered by the adoption of new titles (varying with the branch of engineering) derived from the Greek, such as "elektrologist, meccanologist, and gephuralogist," as suggested by Mr. L. Thornton in the *Bulletin* of the Sydney Division of the Institution of Engineers, Australia. While there is a precedent in the introduction of similar words by other professions, such self-descriptions are more apt to be used by the charlatans, who use pretentiousness as a cloak for ignorance. Misuse of the term "engineer," by which so many great men have been proud to be described, should not drive trained practitioners to abandon it. A better example is shown by the surgeon who has attained to his honourable status from relatively humble beginnings and has abbreviated his title. Moreover, "surgeon" is derived from words which mean merely a manual worker, whereas the word "engineer" has its root in "skill."

Business Training

INDUSTRIAL and trading companies continue to show their appreciation of the work done by the Department of Business Administration of the London School of Economics in training capable students for the higher posts in their service for which special qualifications are necessary. It is seven years ago since the Department commenced operations, and business firms are turning to it increasingly when they require officials of either sex who are of the right material to qualify for promotion to managerial rank. If we may single out an item as of particular interest in our own sphere, we will mention that one firm had the co-operation of the Department and the expert supervision of a member of its staff in a statistical investigation of the cooking and heating arrangements in London homes. A booklet has been issued regarding the arrangements for the 1937-38 session, and we commend it to the notice of prospective students either at college or in business who, in their education and experience, have already laid the foundation upon which to build a higher business administration career. Employers who are not familiar with the excellent purposes of the scheme, but who may wish to consider the wisdom of lending their co-operation and reaping advantage, might also find the booklet worthy of study. Copies can be obtained from the London School of Economics, Houghton Street, Aldwych, W.C.2.

Large H.P. Steam Plant

FOR a 62,500-kW extension of its Twin Branch generating station the Indiana and Michigan Co. intends, the *Electrical World* states, to go from 600 lb. per sq. in. (the present boiler pressure) straight to 2,500 lb. and 940 deg. F., missing the 1,250 lb. stage employed in several recent stations in the United States. The new boiler is to be fired by pulverised coal and will supply steam at 2,400 lb. per sq. in. to a 22,500-kW turbine cross-compounded with a 40,000-kW 400-lb. turbine. The estimated capital expenditure on the extension is $4,000,000. The new pressure, which is close to the suspected steam dissociation corrosion limits, has been selected, it is said, entirely on economic grounds and as the highest for which natural circulation boilers can be built.

Our Overseas Trade

A SATISFACTORY feature of British overseas electrical trade last month was the pronounced increase in the value of goods and apparatus leaving this country. The amount—£1,142,928—was the highest recorded for a number of years, and exceeded the July, 1936, figures by £270,189, or 31 per cent. Nearly every class of goods shared in this improvement. The lower figures in the machinery section should not be regarded as serious, as a single order for generating plant may run into thousands of pounds, so that appreciable variation in shipments from month to month is inevitable.

Aeroplanes and Overhead Lines

PROMINENCE was given in the newspaper reports of an aeroplane crash on Tuesday to the statement that the wrecked machine fouled an 11-kV overhead line. As far as we have been able to ascertain at the time of going to press, the plane was damaged by the forced landing, its occupants escaping unhurt and the only material significance of the electric line was that the impact caused an interruption in supply. As an obstruction the line was comparable with trees or houses and of considerably less importance than a factory chimney or a church spire. Incidentally, transmission line towers make tall chimneys obsolete. The amount of appreciable extra risk of damage to aircraft due to overhead lines may be deduced from B.S.S. 563-1934, which lays it down that only in the vicinity of an aerodrome or in exceptional cases (such as, we presume, the unusually tall towers required for certain river crossings) do objects as low as the normal height of a transmission line require to be lighted.

First Aid

THE importance of an immediate starting of attemts at resuscitation of a victim of electric shock cannot be over-emphasised. It is of equal importance that the treatment should be prolonged as often those apparently dead have recovered after one or two hours of life-saving effort. Training in first aid, as suggested by a correspondent this week, is certainly most desirable in factories, but even those who are unable to receive full instruction should be required to know how to tackle the situation in the first instance in accordance with the simple and clear directions given in the ELECTRICAL REVIEW's card of suggestions.

U.S. Follows Us

FOR many years the British electricity supply industry was invited to follow the example of the United States and get a move on. It did so, and now in some respects is ahead of its American counterpart. We reported recently that the American supply companies were "discovering" the water-heating load and during 1936 increased their sales of apparatus for this purpose by 48 per cent. There seems to be ample scope for development, for while "saturation" was given as 82.5 per cent. for washing machines, 41.1 per cent. for refrigerators and 93 per cent. for irons, with high figures for other appliances, water-heating was not even mentioned. In their search for more business the Americans are also seriously considering the trolley bus. Here, again, we can claim to be well in front of them, but not so far advanced as to warrant complacency. Let us see that our lead in these two directions is maintained while we rapidly advance to the American level in other applications of electricity.

Prices and Propaganda

EXPERIENCE has proved that reductions in the price of electricity constitute one of the finest forms of propaganda, even small concessions having a profound psychological effect upon consumers. In a number of areas, however, the position is being arrived at where, most premises having already been connected to the supply, the main avenue of expansion in sales lies in fostering the use of more apparatus. As additional supplies to existing consumers under two-part tariffs do not include any fixed charge, the average price received consequently falls, sometimes quite appreciably. It may not, therefore, be possible to make direct reductions, but the opportunity should not be lost of giving publicity to the sum which has been conceded by reason of the lower average price obtained.

Developing Rural Areas

Work by the County Company's associates in Kent and Sussex

NOT only does the coming of electricity to rural districts enable new industries to be established, but in many cases it is only the establishment of new industries that makes the supply of electricity to small villages for domestic and other purposes an economic proposition. This fact was brought home to us very forcibly during a short visit to the Kent and East Sussex areas supplied by three of the County of London Electric Supply Co.'s associated companies, the West Kent Electric Co., Ltd., the Kent Electric Power Co. and the Weald Electricity Supply Co., Ltd.

The supply to Horton Kirby, a small village in the first mentioned company's area, is a case in point, since it is safe to say that, but for the 25 kW required by Flewitt & Millen, Ltd., for the manufacture of bootlaces, a public supply to the village would not have been so promptly forthcoming. At this factory, the only one in the village, about 50,000 kWh of electricity is consumed annually for bobbin winding, braiding and tagging machines which produce half a million laces every week.

The West Kent Company

Such combination of industrial with domestic schemes has enabled the West Kent Co. to supply virtually the whole of the villages in its 100 sq. mile area, which extends from West Wickham to Southfleet and from Crayford to Westerham. One of the latest schemes covers the Kingsdown, Ash and Fawkham areas. Actually it is only in the last seven or eight years that the company has really turned its attention to its rural area which represents about two-thirds of the whole, and as an indication of recent progress, Mr. A. E. Hammersley, the chief engineer and local manager, tells us that since 1932 the number of consumers has risen from 9,000 to 27,000.

Last year the total maximum demand was in the neighbourhood of 28,000 kW and 81 million kWh of electricity was sold. It is expected that over 100 million kWh will be sold this year. Bulk supplies are given to neighbouring electricity undertakings and over 9 million kWh is now consumed annually by engineering, paper, flour, plywood, wire and engraving works.

[*Elec. Rev. photo.*

Carrying out overhead line extensions at Horam to supply a sewage works

(Below): The Kent Power Co.'s Holborough sub-station and (right) laying an 11-kV cable to reinforce the Orpington supply by linking up with Dartford [*Elec. Rev. photos.*

More than 3,000 kW is taken by the Vickers-Armstrong factories at Crayford and Wilmington, while Murgatroyd's tannery in the district, which has had its own plant for twenty-five years, has recently changed over to the public supply. A useful load of 750 kW has just been arranged for the new brake lining factory of Richard Klinger, Ltd., on the Sidcup By-pass at Upper Ruxley.

For their paper-making plant at St. Mary Cray with a total load of 680 kW, William Nash, Ltd., require 3 million kWh of electricity a year, electric motors of all sizes from 1/10 to 350 h.p. being employed for such operations as cutting, dusting, pulping, weighing, air cooling, calendering and water pumping. This installation, incidentally, is a typical example of the advantage and simplicity of the electric drive in situations where perfect synchronisation is essential.

Most of the extra-high - voltage transmission lines have been placed underground, only 20 out of 120 miles being overhead. Low-voltage lines are, however, largely overhead in the rural areas. Villages are becoming increasingly interested in street lighting and many already have adequate installations. Steady progress is being made with cooker, refrigerator, water-heater and wash-boiler installations and in this connection much assistance is being derived from the showrooms at Orpington, Hayes and Petts Wood, as well as from the County Co.'s travelling showroom. An opportunity is afforded at the new Orpington offices to see various types of panel, tubular, skirting and convection heaters which are operating under actual working conditions.

The Kent E.P. Co.

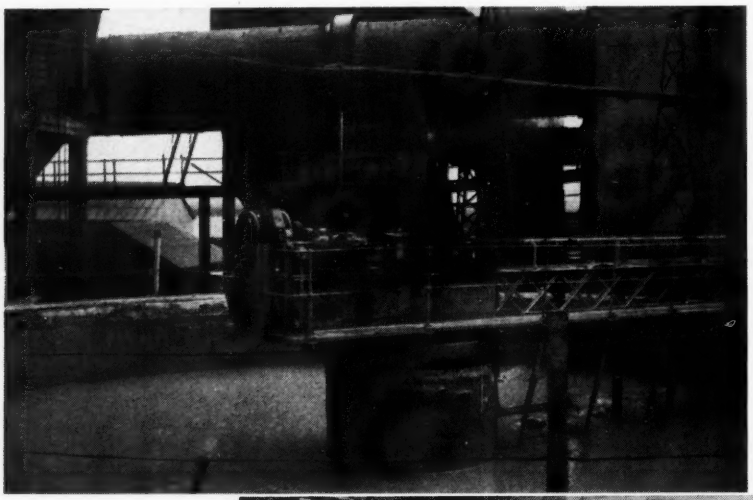
In spite of its area being mainly rural—the only towns of any size being Rochester, Chatham and Sittingbourne—a characteristic of the Kent Electric Power Co. (local manager, Mr. J. M. Graham; engineer, Mr. H. F. Knell) is the large demand for cheap electric power ,and there are now over two hundred factories supplied at an average price per kWh very much below the average for all sales, namely, 0.55d. in 1936.

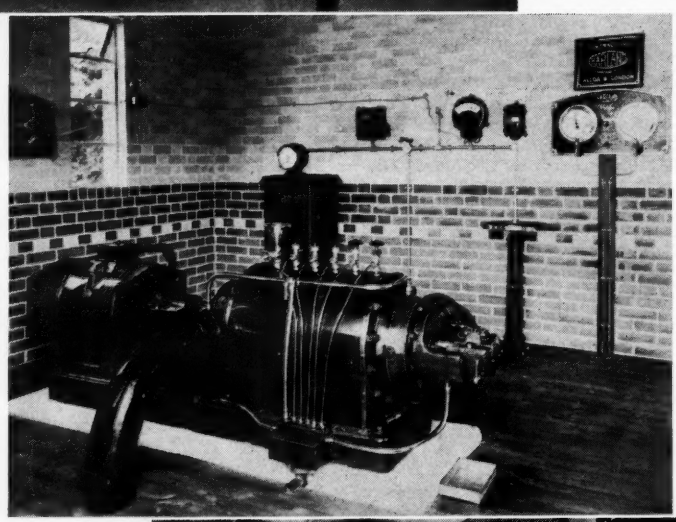
A large proportion of this industrial demand comes from the Thames and Medway Valley districts which form rather more than a quarter of the north-western section of the company's 600 sq. miles or so of supply area. It would be tedious to give a list of the various factories taking supplies, but typical of the more important installations may be mentioned the Swanscombe, Bevans, Holborough, Crown, and Martin Earle works of the Associated Portland Cement Manufacturers, the Alpha cement works at Cliffe, Short Bros.' aircraft factory, Winget's concrete machinery factory, the British Oil and Cake Mills Rochester works, and the plaster board factory of Gyproc, Ltd.

Amongst other industries availing themselves of electricity are oil refineries and stores, and brick, sand, plaster, stone, tile and ballast works. An interesting example of the way in which electricity enables the smaller, more or less self-contained industries to be established in pleasant country surroundings is to be found at Ightham where a 100-kVA plant has been in-

stalled for the manufacture of buttons from ivory nuts.

Covering nearly half the county of Kent, the company's supply area roughly includes the area bounded on the map by a quadrilateral drawn from the edges of Folkestone and Whitstable to Ightham and Dartford (excluding the municipal undertakings of Ashford, Canterbury, Dartford, Faversham, Gillingham, Gravesend, Maidstone, Tonbridge and Tunbridge Wells), plus a section extending to the south of Lydd and also the isolated Edenbridge district, both of which are run for the convenience of consumers and economy of administration by associated companies.



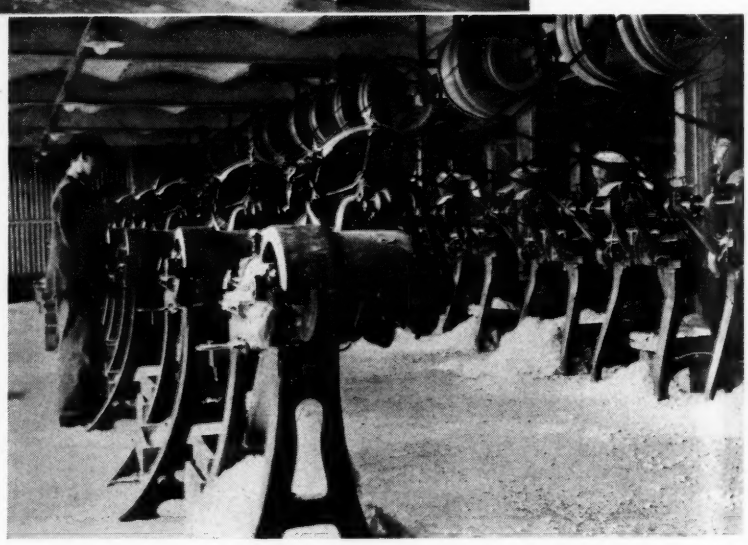


The slurry mixer, with a rotary kiln in the background, at the Alpha Cement Works, Cliffe; the Sevenoaks Water Works Co.'s booster plant; and the electrically operated grooving machines at the Ightham button works [*Elec. Rev. photos.*

Since the County Company acquired the undertaking in 1923 development has been planned on very broad lines. A 33-kV ring main now connects Barking with the industrial centres on the Kent bank of the Thames and Medway and the 11-kV network has also been laid out with an eye to the future. The double transmission line east of Sittingbourne, serving Faversham and Whitstable, has been designed for 33 kV as far as Faversham, but is at present operated at 11 kV from Sittingbourne.

In addition to the main transmission system from Sittingbourne there is a duplicate feed to the Faversham sub-station from the Canterbury grid station. Similarly in the western area the 11-kV network south of Strood has a duplicate feed from Cobham from the 33-kV lines, while north of Strood the 11-kV network is duplicated to Cliffe with an additional connection linking up with the Cobham sub-station.

Altogether the company now possesses nearly 700 miles of lines, of which 106 miles (about one-third overhead) are 33-kV transmission lines. In the urban districts practically all the fifty miles of extra-high-voltage and 145 miles of low-voltage lines are underground, but only about one-third of the 175 miles of extra-high-voltage and 220 miles of low-voltage lines in the rural districts are underground. Mains extensions carried out so far this year amount to over forty miles. Nineteen new sub-stations have also been erected this year, bringing the total to 203, of which 182 are 11 kV. Work has just started on the Littlebrook power station, which is being built at the request of the Central Electricity Board, and the first section of which will have 120,000 kW of plant.



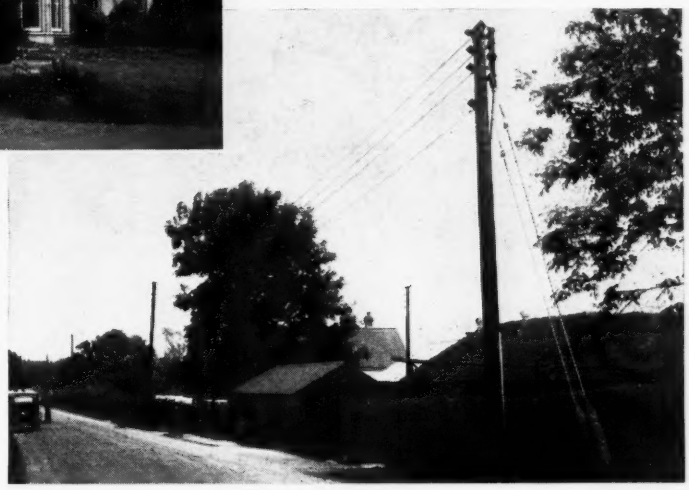
During the first half of the current year new power contracts, the large majority of which are in rural areas, have been concluded, which are estimated to produce an additional consumption of over 25 million kWh per annum and further contracts for "Osira" lighting involving about ten miles of main streets in Chatham and Rochester have been obtained.

Practically every village now has a supply and since 1922, the year before the County Company took control, the number of consumers has risen from 1,210 to over 25,000, new connections now being added at the rate of about 4,500 a year. Fourteen years ago, too, the annual sales were only about 3¾ million kWh, averaging 3.45d. per kWh; last year 193 million kWh was sold at an average of 0.55d. Ten out of every eleven domestic consumers on the company's system take advantage of the two-part tariff, and the hundred or so farmers now connected or being connected can get their supplies at an average price of approximately 1¼d. per kWh. Bulk supplies represent only about 15 per cent. of the total. Offices and showrooms are to be opened by the company in Rochester in a few months.

The Weald Co.

The 500 sq. miles supplied by the Weald Electricity Supply Co., Ltd. (managing engineer, Major C. B. Grace), in South Kent and East Sussex, are of an essentially rural character, the majority of the consumers being either private residents or agriculturalists. Over three hundred farms, dairy, agricultural, fruit and poultry, are now taking supplies for all classes of service and the tariffs in force enable generous use to be made of electricity at costs which compare more than favourably with competitive methods.

Little has yet been done in this area in the way of establishing new industries and the forty-five factories, workshops, &c., which do exist are largely connected with the farming industry and between them represent a load of only just over



The local head office of the Weald Electricity Supply Co., Ltd., at Highgate, Hawkhurst; and low-voltage overhead lines supplying a chicken farm at Horam
[Elec. Rev. photos.

1,000 kW. They include two dairy depôts (taking 149 kW); a chemical factory (106 kW); six flour, &c., mills (232 kW); nine builders' workshops, woodworking factories, &c. (71 kW); a canning factory (15 kW); a poultry and egg packing station (6 kW); eight water pumping stations (335 kW); and seven small sewage pumping stations (39 kW).

A policy of steady progress and expansion has been pursued by the management since the County Company took over the supply from Callender's Cable & Construction Co., Ltd., at the beginning of 1932.

There are at present only two out of fifty-four parishes in the area without supplies and to these places mains extensions are already contemplated. Over 750 miles of overhead and underground lines have been constructed during the twelve years of the company's existence and 320 sub-stations, largely of the pole-mounted transformer type, have been provided.

Last year the sales of electricity at 10,583,547 kWh were nearly two and a half times what they were in 1932 (4,410,750 kWh), and there are now nearly 13,000 connections. Of the 11,000 domestic consumers some 8,000 are taking their supplies under the "all-in" tariff. Assisted wiring is available for all types of premises and, in addition to the general hire-purchase schemes for the usual electrical appliances, the company has a scheme for the hire of water heaters.

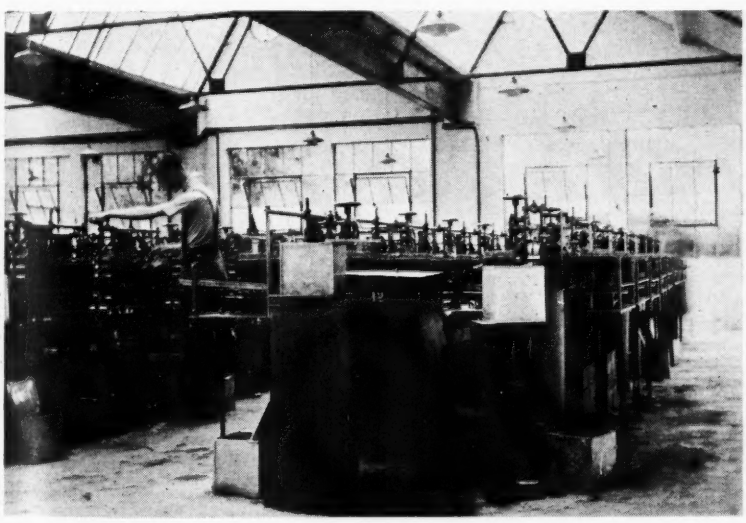
At Highgate, Hawkhurst, a charming country mansion has been adapted for use as the company's head local office and there are branch showrooms at Crowborough, Forest Row and Horsebridge. Additional showrooms are about to be opened at Tenterden and Heathfield. A day and night service is maintained at all depôts for the convenience of consumers, the Wiring and Trading Department carrying out all internal installations and supplying all kinds of electrical apparatus.

Street lighting is provided in eighteen places in the area by means of nearly 900 lamps, and further schemes are under consideration.

Generally speaking, water undertakings may be said to be conservative in their outlook, and our notice has been drawn by Mr. C. F. Mounsdon, managing engineer of the Sevenoaks and District Electricity Co., Ltd., another of the County Company's associates, to a very neat little Harland booster plant recently installed by the Sevenoaks Water Works Co. in face of a long-standing prejudice. It is only a 20-h.p. centrifugal plant but it is automatically controlled and the station was built to accommodate a duplicate set which is now being installed. The capacity is 18,000 gal. per hour, the head varying from 150 to 170 ft. The company is now very pleased at its venture and several similar plants are to be installed.

Development in S.W. Midlands

THE year ended March 31st last was one of continued expansion and growth of business for all the electricity undertakings in the South West Midlands District, which covers an area of 1,327 square miles. This is stated in the annual report of the South West Midlands Advisory Joint Committee, of which Mr. E. J. Jennings is secretary. In support, he shows that, whereas the total connections of consumers' apparatus in 1935-36 advanced by 13 per cent., last year the increase was 17 per cent. Additional consumers numbered 28,460, or 11 per cent., in 1935-36 and 44,689 (16 per cent.) last year, while the increases in sales were 78.3 million kWh (11 per cent.) and 117.5 million kWh (15 per cent.), respectively. Consumption per head of the population rose from 458 to 520 kWh. A further 112 miles of extra-high-voltage mains and 291 miles of low-voltage distributors were provided to meet new requirements. On the generation side, the fuel figures reported by the seven undertakings in the District worked out at 1.7391 lb. per kWh generated, as compared with 1.8198 lb. in the previous year. Demonstrating the improved or more effective use to which generating plant was put, a summation of the maximum simultaneous loads on the feeders reveals an advance of 13 per cent., although 17 per cent. more electricity was generated. The capacity of the Hams Hall power station (Birmingham Corporation) was substantially reinforced during the year, and another 50,000-kW turbo-alternator and two 250,000-lb. boilers are to be added. Work was also put in hand on extensions at the Stourport station of the S.W. & S. Electric Power Co. which will raise its effective capacity to 146,000 kW. The difficult task of changing the frequency of supply was completed by the S.W. & S. Co. on October 30th last, and by the Birmingham Corporation on May 15th.



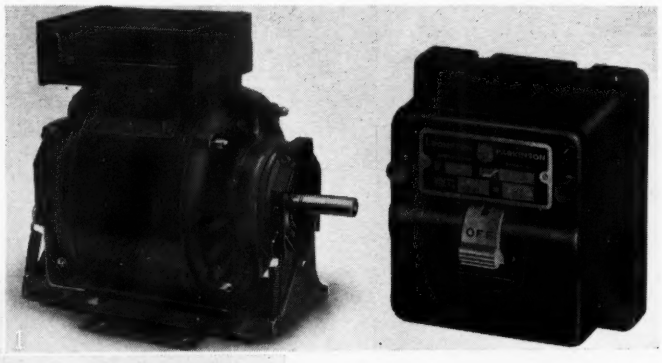
Electrically driven braiding machines at Flewitt & Millen's bootlace factory, Horton Kirby
[Elec. Rev. photo.

Controllers for Small Motors. By J. B. Scott

Securing adequate protection

THERE seems to be a general idea that fully protective control gear is not worth while for motors of 0.5 h.p. or smaller size. In very many cases machines of this sort are controlled with a triple- or double-pole switch only, giving the motor no protection whatsoever against overload.

A switch-fuse may protect the motor against a short circuit, but is really of little use against an overload of, say, 50 per cent., as the fuse wire has to be able to withstand the rush of current at the moment of switching on, which in many cases may be six times the full-load current of the motor.



1. Crompton Parkinson motor and controller. 2. B.T.H. equipment. 3. A machine with Met-Vick. motor and control gear

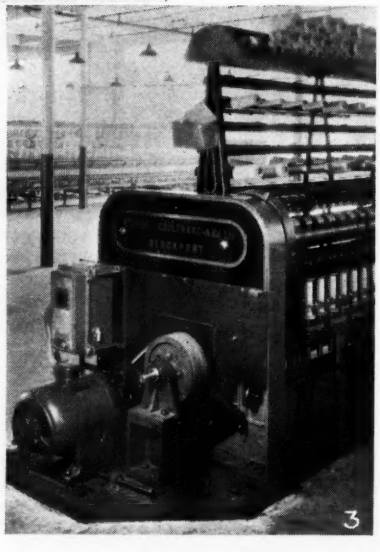
What, then, is the best type of control gear for these small motors? First, one must have a starter which will give overload protection, so that the starter will trip out after 30 min. on 25 per cent. overload, after 10 min. on 50 per cent. overload, and instantaneously on 100 per cent. overload, assuming the motor has reached its maximum temperature rise, with some form of time delay action.

Trip Gear

Various authorities insist on magnetic safeguards against overloads, as opposed to the thermal type. The former certainly have some advantages, in so far as they are not affected by ambient temperature. Notwithstanding this, however, manufacturers have made many improvements in the design of thermal trip gear in the last few years, and, at any rate for small motors, the thermal blade is largely used by various manufacturers for small starters chiefly because the cost is so much less than that of the magnetic type; and for small motors it is desirable to keep the selling price down to the minimum, otherwise the starter would cost more than the motor.

It is assumed that for f.h.p. motors one can use direct-on-line starters fitted with thermal overload blades, which will give the necessary protection against overload, and will not trip out at the moment of switching on. For many applications this type of starter is quite satisfactory, but many factory engineers are inclined to think that no-volt protection is rather a luxury for such small motors. Take the case of a sewing machine driven by, say, a ¼ h.p. motor. Supposing the main fuse blows, the machine stops and the girl operating the machine starts talking to someone nearby. When the electrician puts a new fuse in, the girl, having forgotten to switch off, may lose a finger. It all sounds very elementary, but how frequently do we read of such things.

Where individual drives are concerned it should, therefore, be a regulation that a no-volt coil is fitted. After all, it is possible to purchase a good push-button starter with no-volt coil and thermal overload releases for about 30s., and reliable British-made starters can be obtained for considerably less. Factory engineers, in their own interests, should not overlook no-volt protection from the points of view, first, of being an insurance against workmen's compensation, and secondly, ensuring the complete protection of the electrical apparatus.



Many control manufacturers have an isolating switch built into the starter, which is interlocked with the lid, so that when the lid is opened the supply is cut off from the starter. The fact remains, however, that there are live cables in the starter case. Another disadvantage so far as small motors are concerned is that the price of such starters is fairly high compared with a standard unit. The simpler and in many ways better arrangement is to have a separate isolating switch either just above or below the starter, or at some conveniently near position. A 500-V, triple pole, iron-clad switch can be purchased for as low a price as 5s.

It is very desirable to have an isolating switch with each starter, especially where there is a batch of motors controlled from the one main, as starters will need inspection and adjustment from time to time, and it is not often convenient to shut down a whole section while the maintenance engineer adjusts one starter.

In every case it should be the duty of the factory engineer not only to see that starters are regularly inspected and cleaned but go over each starter with a screwdriver to make sure no screws have worked loose in the course of time, especially if there is much vibration present.

So far we have dealt only with the factory side of the problem. Thousands of these motors are sold every year for such applications as bread-slicing machines, cake mixers, potato peelers and sausage-filling machines, and in nearly all these cases the equipments are resold to non-electrical people.

Bearing this aspect in mind it is very important that the control gear to be sold with these often expensive machines should be foolproof, simple to operate and absolutely reliable. The control gear has often to be interlocked with certain parts of the machine itself, *i.e.*, it should not be possible to start the motor of a bread-slicing machine until the guard is in position.

In these cases a simple direct-on contactor starter with push-buttons marked "on" and "off" will meet the case, and the contacts on the guard can be in series with the no-volt coil. Here, of course, it is not so necessary to have an isolating switch; in fact, the less apparatus required to drive the machine the better.

In conclusion, the author is of the opinion that with the large increase in the use of f.h.p. motors, especially on machine tool applications, it may be necessary for the Home Office regulations to be extended to include, or have, a special section for these small motors.

Electricity for Rhodesian Mines

The first power station designed by the Southern Rhodesia E.S. Commission is being erected at Gwanda to supply the mines of the Gwanda and Filabusi gold belts with power, states the *South African Mining and Engineering Journal*. It is likely that the project will be followed by a second station at Que Que, on the Umniati River, and possibilities of a third at Shabani are being investigated. Since July 1st last year the Commission has acquired the power stations of Umtali, Gwelo and Gatooma, and has made an agreement for the purchase of power in bulk from the Salisbury and Bulawayo municipalities. The Commission has taken over the power lines recently erected by the municipalities of Umtali and Gwelo to Penhalonga and Selukwe. It is at the moment erecting power lines from Salisbury to Mazoe, and is considering extending the Umtali-Penhalonga line to Odzi.

Rural Electrification in the U.S.A.

By G. W. Preston, A.M.I.E.E.

Sixty-thousand miles of lines already approved

AT a time when so much attention is being focused on rural electrification and the co-ordination and reorganisation of our distribution systems a few details of what is being done at present in the United States in this connection may be of interest. While in this country the aim is to reduce the number and increase the size of distribution areas, American legislation seems to be acting in exactly the opposite direction by endeavouring to create as many new small and relatively inefficient distribution organisations as possible. The underlying reason for this is the expressed determination of the Roosevelt Administration and of the public power group to bring cheap power facilities to the farmers on the land. As has often been stated by George W. Morris, a prominent leader of the latter group, their belief is also that "a free people cannot permanently submit to the private monopoly of a necessity of life." It is undoubtedly this sentiment which has largely affected the trend of Governmental action in the field of electricity supply.

In 1935 a Rural Electrification Administration was formed by executive order of the President. This Administration, commonly known as the R.E.A., was made permanent by the passing of the Rural Electrification Act of 1936. The Administration is under the direction of an administrator, who receives a salary of $10,000 per year and is authorised to make loans for the purpose of financing the construction and operation of generating plants and transmission and distribution lines in rural areas, it being laid down in the Act that preference shall be given to publicly owned utilities and co-operative and non-profit-making organisations. The amount of the loans to co-operatives in each State is limited, and for the first year up to June 30th, 1937, the administrator had at his disposal a sum of fifty million dollars, an additional forty million dollars being available annually during the remaining nine years during which the R.E.A. is intended to operate. The actual allotment of funds during the first year amounted to about $46,000,000, or £9,200,000.

Preparation of Schemes

The Administration in Washington employs a large staff of engineers and others who deal with the workings of the scheme, which operates as follows: A group of farmers or other residents in a rural area who wish to obtain a supply of electricity get together and appoint an engineer to prepare a tentative scheme for a local distribution system, details of which scheme are then submitted to the R.E.A. If the scheme is at all feasible it is tentatively approved and an allotment to cover all construction costs, including transmission lines, transformers, meters, &c., roughly on the basis of $1,000 per mile of overhead line, is allocated to it; and the engineer, with the approval of the R.E.A., proceeds to draw up a detailed scheme with specifications and to advertise for tenders. When the selected tender and the contractor have been approved by the R.E.A. a contract is signed and construction work is then begun.

At first the average period elapsing between the receipt by the R.E.A. of the first application for a loan and the completion of the scheme exceeded 40 weeks, but the normal scheduled period has now been reduced to 22 weeks.

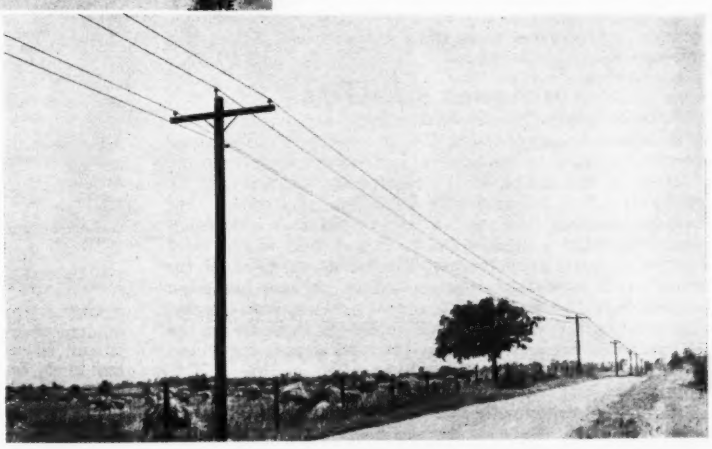
The engineers appointed by the local co-operatives, and approved by the R.E.A., to draw up the schemes often have but little experience of rural line work and have to rely to some extent on technical assistance from R.E.A. and other engineers. Their remuneration is not very high, however, since it amounts to only 3 per cent. of the cost of the project, which is cut to a minimum. (The fee works out at about £5 per mile of line.) For this sum the engineer has to prepare preliminary and detailed schemes together with a specification, advertise for and examine tenders, set out the lines, supervise construction and inspect the finished work.

Mr. G. W. Preston is electrical engineer to the Copper Development Association

Upon completion and approval by the R.E.A. the scheme is handed over to the local co-operative to operate, the R.E.A. retaining the right to take over control if operation is not considered satisfactory. The schemes are usually run by a locally appointed manager, either full or part time, who may be a member of the co-operative group and who may or may not be paid. Most of the people connected with the schemes are local farmers or business men with little experience of electricity supply. Frequently little attention is given to such matters as sales organisation and maintenance, and it is difficult to see how some of the schemes can ever hope to be successful, particularly in view of the fact that even well-organised and thoroughly experienced utility companies have not found it possible to give supplies to many of the R.E.A. areas on a reasonable profit-making basis.

The co-operatives, on the other hand, have many advantages over the utilities. They do not have to make a profit and do not seem to have anything to lose if they make a loss. Their capital is provided by the Government and loans, which are supposed to be self-liquidating within a period not exceeding 25 years, bear interest only at the average rate payable by the Government on its obligations, which is about 2½ to 3 per cent. at the present time. The co-operatives also pay no taxes at present, although this is a matter which is likely to give rise to some trouble in the future, particularly if the State Utility Commissions step in and apply taxation.

Even with these and other advantages there is evidence that all is not well in certain instances, and in some cases co-operatives have already found it necessary to increase the rates for supply to a material extent. Such increases tend at once to defeat the whole object of the R.E.A. schemes, namely, the provision of ample power supplies to the farming communities at low rates, for which purpose Congress has



Two typical American rural lines. Above: In Indiana—long-span vertical construction. Right: In Ohio—a three-phase, four-wire line

allotted the sum of no less than $410,000,000 (about £82,400,000).

In one or two instances R.E.A. projects are handled on a State-wide basis, all the separate groups in the State being linked to one co-operative which will eventually establish a centralised management and sales organisation providing holding company services to the local groups.

Bulk supplies for R.E.A. co-operative schemes are obtained wherever possible from the nearest municipally owned generating plant, power or utility company, but in some instances, when the nearest source of supply is, say, 50 miles or so distant, Diesel generating plant is installed.

Line Construction

When necessary a 22- or 33-kV transmission line is constructed from the source of the supply to act as backbone of the scheme. These lines are three-phase, wood-pole, pin-insulator lines without earth wires. Most of the distribution lines are 12-kV, three-phase, four-wire or 6.9-kV, single-phase, two-wire lines on wood poles with wooden cross-arms and pin insulators, the single-phase lines being in the majority. In the case of the latter lines the phase wire is often carried on a single pin insulator at the top of the pole, the earthed neutral being accommodated on a small bobbin insulator on the side, as shown in the left-hand picture (p. 239). A typical conductor arrangement for a three-phase four-wire line is shown in the other picture. Pole-mounted fuse switches or three-shot repeating fuses are often installed at the junction of spur lines with the main lines, and although the installation of such protection is usual it is not universal.

Multiple earthing is adopted and all transformers are single-phase, three separate transformers being used for three-phase supplies. Each consumer has a separate transformer, which usually has a split secondary winding giving a three-wire, 110/220-V service. The transformers are of the rural type, having only one insulated bushing, the earthed neutral wire being bolted directly to the case. There is no l.v. protection at the transformer, but there is a fuse cut-out in the h.v. phase wire lead. Consumers' meters are connected solid to the l.v. side of the transformer and are of an outdoor type, being installed either on the transformer pole or on the outer wall of the house. There are l.v. fuses between the meters and the house circuits.

A minimum of three consumers per mile of line is aimed at and the average for all R.E.A. projects up to the present is slightly over 3.5. The utmost economy in line construction is therefore necessary and all lines are erected to the minimum requirements of the National Safety Code, careful consideration being given to effecting every possible saving in line costs.

Lines follow the roads, which for the most part are straight, and moderately long normal spans from 300 to 400 ft. are usual, though on occasion individual spans up to 700 ft. or more have been included. In these circumstances a conductor having a fairly high tensile strength is required. Steel-cored aluminium conductors have been used fairly extensively, but considerations such as ease of handling and erection, maintenance and comparative freedom from vibration troubles have resulted in the adoption of copper conductors for the majority of the lines erected up to the present.

For the three-phase, 12-kV lines Nos. 2, 4 and 6 A.W.G. (0.052, 0.033 and 0.021 sq. in.) conductors are used; for single-phase lines and low-voltage service connections the conductors are mostly Nos. 6 and 8 A.W.G. (i.e., 0.021 and 0.013 sq. in.). Some solid-copper wire conductors are used, but the majority of the copper lines employ three-wire composite conductors made up of two copper wires and one " Copperweld " copper-clad steel wire.

Development Speeded Up

Whatever opinion is held regarding the underlying motives for the establishment of the R.E.A. and the merits of applying taxpayers' money to subsidise a public-ownership campaign in favour of one section of the community, there can be no doubt that R.E.A. activities have resulted in some good. They have, for instance, done much to stir up the more complacent power and utility companies and to compel them to give more attention to rural development. The merest suspicion of the formation of a local co-operative within its area has often been sufficient to force a utility company into instant activity, with the result that it has been estimated that during the last two years five times as many new rural lines have been built by power and utility companies as by R.E.A. co-operatives.

R.E.A. engineering methods have also done much to demonstrate that rural line costs can be reduced. Many of the utility companies, thinking only in terms of urban and suburban construction standards, have hitherto not infrequently been unable or unwilling to adapt their ideas to rural conditions. A similar state of mind is undoubtedly to be found in this country and one cannot help feeling that the success of our own efforts at rural electrification will depend largely upon the degree to which a sane freshness of mind can be brought to bear on the problems involved. A little experience is worth a lot of conjecture, and there is ample experience from which we might benefit and which should be sufficient to discount any amount of prejudice.

If supplies of power at reasonable rates are to be made available in the more sparsely populated areas of this country rural line costs must be reduced to a minimum, and to this end it seems inevitable that some relaxation of regulations must be permitted. It is an encouraging sign, therefore, that some slight tendency in this direction is already noticeable. The use of multiple earthing with its resulting saving in insulation costs, wooden cross-arms which virtually eliminate bird trouble, give better insulation and reduce the number of line " outages," and the omission of earth bars and other so-called protective devices of doubtful efficacy are but a few of the many ways in which experience has shown that line costs can be reduced.

On the whole, American utility and power companies are both enterprising and progressive, and it is mainly in the wide, open spaces of the Middle and Western States that R.E.A. schemes have been most readily adopted. In the smaller and more compact areas, such as the New England States, where the coverage of the companies is fairly complete, the co-operative idea has not found favour.

During the first two years of the R.E.A. allotments amounting to nearly $60,000,000 (£12,000,000) were made in respect of over 300 approved projects, involving the construction of about 60,000 miles of rural overhead lines. When it is borne in mind that these lines are for R.E.A. co-operative schemes only and that many times that mileage of line will probably be constructed by utility and power companies, some idea may be gained of the concentrated effort now being made to bring adequate supplies of electricity to the rural populace of America.

Purchase Terms for Supply Companies

THE undertaking of a company formed under Section 39 (1) of the Act of 1926 to serve a large area, including the whole of the districts of two or more local authorities, is subject to purchase after the expiration of fifty years from the confirmation of its Special Order. The terms of payment are prescribed under the Act as a sum equal to the capital properly expended on plant, &c., suitable for use at the time of purchase less depreciation. As reported in the ELECTRICAL REVIEW last week, the draft Scale of Depreciation (Purchase of Electricity Undertakings) Special Order, 1937, has now been made by the Electricity Commissioners. Depreciation up to the time of purchase is at the rate per cent. per annum on the original cost specified in the following table. If the total amount of depreciation for any asset at the end of any year is equivalent to 90 per cent. of the original cost in the case of buildings, &c., or 95 per cent. in the case of transformers of above 100 kVA, distribution switchgear, cables in ducts and overhead lines, then depreciation for the remainder of the period shall be 2½ per cent. per annum on the original cost less depreciation. The total amount of depreciation shall not exceed the original cost of the item. The Order will come into force after it has been for thirty days before Parliament if neither House presents an address to the King against it in the meantime.

Asset.	Rate per cent. per annum on original cost.
Freehold land	Nil
Offices and showrooms	1½
Other buildings and civil engineering works (other than plant foundations)	2½
Generating plant and cooling towers (including plant foundations)	5
Transformers of over 100 kVA (including foundations)	3½
Other transformers, kiosks and sub-station equipment (including plant foundations)	5
Generation switchgear	5
Distribution switchgear	3½
Cables direct in ground	2½
Cables in ducts	2⅝
Ducts	2½
Overhead lines :—	
(i) On steel or reinforced concrete supports	2⅝
(ii) On wooden supports of a standard not lower than that prescribed in the Post Office Specification or the B.S.S. current at time of erection	2½
(iii) Other	3½
Meters	5
Self-propelled vehicles and tools	10
Office equipment	10
Rental wiring on consumers' premises	5
Apparatus let on hire	10
Leasehold interest in land	One hundred divided by the period of the lease or by the unexpired period of an assigned lease.
Cost of clearing site	One hundred divided by unexpired period of lease at date of clearing.
Assets not otherwise provided for	5

The Radio Exhibition—I.

By W. E. Miller, B.A. (Cantab.), M.I.W.T.

An indication of the types of apparatus to be shown at Olympia

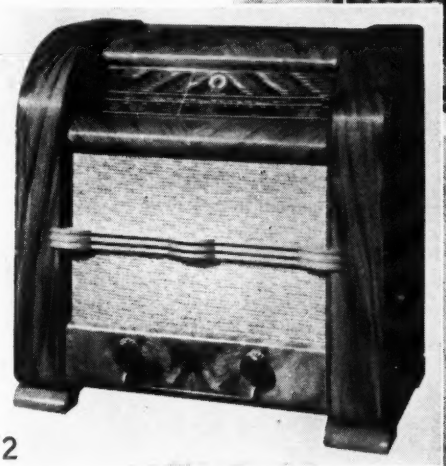
THIS year's National Radio Exhibition, which opens at Olympia on Wednesday next, August 25th, and continues until Saturday, September 4th, will feature all-wave, and therefore, all-world, radio reception.

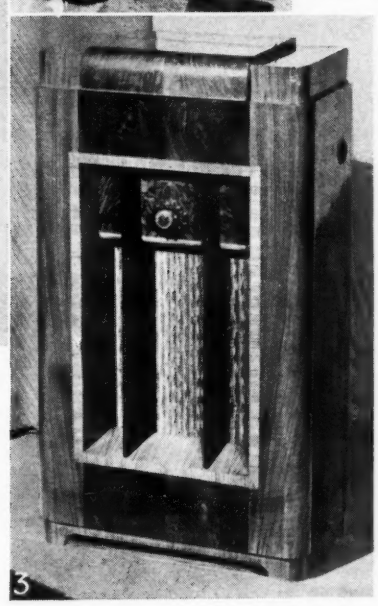
The Radio Manufacturers' Association, the organisers of the exhibition, have adopted as their slogan for this year "The World is Yours with Modern Radio," and this is to be emphasised in a large display piece at the west end of Radiolympia, which is the most ambitious yet attempted for a radio show, and forms an elaborate example of moving electric sign work.

This year the number of exhibitors at the show will slightly exceed that of last year, and in all some 150 firms will be represented. For the first time one section of the gallery will be devoted to a "museum" of radio receivers and components showing examples of apparatus in use from pre-broadcasting days to the present time.

Suppliers of components for set manufacturers' use will also be grouped together in the gallery, with other trade exhibits. Arrangements have been made to include exhibits by the British Broadcasting Corporation and the General Post Office. The latter will be devoted, it is understood, to information on the suppression of electrical interference with radio. The R.M.A. will also have an information bureau at the show.

Last year for the first time demonstrations of high-definition television were given. This year the B.B.C. is arranging special television transmissions during the show period, and these will be viewed in fourteen demonstration rooms, each with a seating capacity of thirty. Each room will contain a receiver made by a different manufacturer.





1. Typifying one of the tendencies in modern cabinet design, this H.M.V. "Armchair Radio" is built into a combined revolving bookcase and glass-topped table. It has an output of 10-W. 2. The G.E.C. "A.C. All-Wave Quality 8" receiver is a three-waveband model with a 6-W push-pull triode output stage. 3. An imposing all-wave console superheterodyne by Philips Lamps, Ltd., is the 701 AX. It has mono-knob control, while the circuit contains several special features designed to improve the quality of reproduction

The majority of the well-known receiver manufacturers will be exhibiting their latest ranges of receivers and radio-gramophones. In only a few cases has an entirely new range been released to coincide with the show, the present tendency being to release sets from time to time during the course of the year.

As far as can be gathered from preliminary information on the proposed exhibits there will be nothing of a revolutionary nature, although some manufacturers prefer to save up a special product for release as a "surprise" on the opening day of the show. Any such releases will be included in a later article. By far the largest proportion of receivers will be superheterodyne types.

In general, as in past years, the tendency is for slight modifications and improvements in circuit design, towards better quality of reproduction, greater undistorted output and enhanced ease in handling.

Large power pentodes are still favoured in the output stage, but in certain cases output circuits include a measure of negative feed-back to reduce harmonic distortion.

A recently introduced valve, the beam power tetrode, is also being used by some manufacturers in the output stage. A special form of electrode construction concentrates the electrode stream into a beam, and ensures greater efficiency and the elimination of certain disabilities of the pentode. Outputs up to 12 or 15 W are quite common in the larger receivers.

A few of the more expensive sets include elaborate circuit additions, such as contrast amplification. This is designed to render *pianissimo* and *forte* passages of music in their correct relationship, and not in the contracted form which the exigencies of normal transmission and reception demand. Automatic frequency control, which ensures dead accurate tuning provided the set is tuned anywhere within the required station's band width, is another refinement which helps the non-technical user to secure the best quality of reproduction.

Cathode-ray tuning indicators, introduced last year, are now common, and have almost entirely superseded earlier types. Tuning scales, as usual, have been redesigned by many manufacturers to increase the ease of tuning and improve their appearance. In some cases the scales are particularly large. Another aid to tuning is the "flywheel" drive, with which it is possible to pass quickly from one end of the scale to the other by spinning the tuning knob.

So-called "all-wave" receivers will be predominant; in fact, some manufacturers will be showing nothing but all-wave models. In most cases only one short-wave band is included to justify the title "all-wave," usually covering about 16 to 50 metres. Other sets, however, have as many as three short-wave bands, in addition to the usual medium and long ranges.

It is interesting to note that some ordinary radio receivers will include a switch position enabling the television sound channel to be received, while a few have a s.w. range extending down to 6 metres.

Some fourteen manufacturers will be showing television receivers, all, as far as can be ascertained at present, being of the cathode-ray type. Apart from standard models at 60 guineas to 120 guineas, it seems that there will be a few models, of simplified design, at lower prices. The maximum picture size is usually about 10 in. by 8 in., but one manufacturer has announced a type using a projection cathode-ray tube giving a picture 20 in. by 16 in., which may possibly be on view.

In some cases the receivers are for the television sound and vision only, but the more expensive types include an all-wave radio chassis, and sometimes a radio-gramophone.

Turning now to other equipment, there will be found to be little change since last year. Components will be shown on

several stands, and public address apparatus will be prominent.

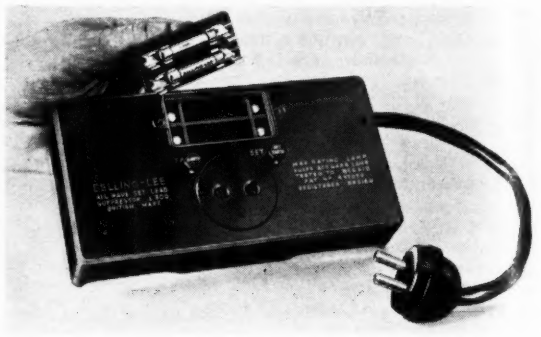
More firms than usual will be showing test and service equipment, one well-known company having introduced a multi-range meter with a full-scale deflection of only 50 microampères on its d.c. voltage ranges. Valve testers and signal generators have in many cases been improved.

There seem to be few further improvements in loudspeakers, which are now almost entirely of the moving-coil type, and have been brought to a high pitch of efficiency.

New valve types, in general, are few, but several firms will be showing what is known as an "international" range, having characteristics similar to corresponding American types. This means that a 6.3 V, 0.3 A heater rating has been standardised in this range. These valves are fitted with the American type "octal" bases, with eight pins evenly spaced in a circle, having a moulded "key" in the centre for quick and easy insertion of the valve in its holder.

Apart from these valves, and some beam power output tetrodes, there will be special types for television circuits (including high-voltage rectifiers). One stand will be devoted to an all-stage valve, which is so designed as to be capable of being used in any position in a multi-valve receiver.

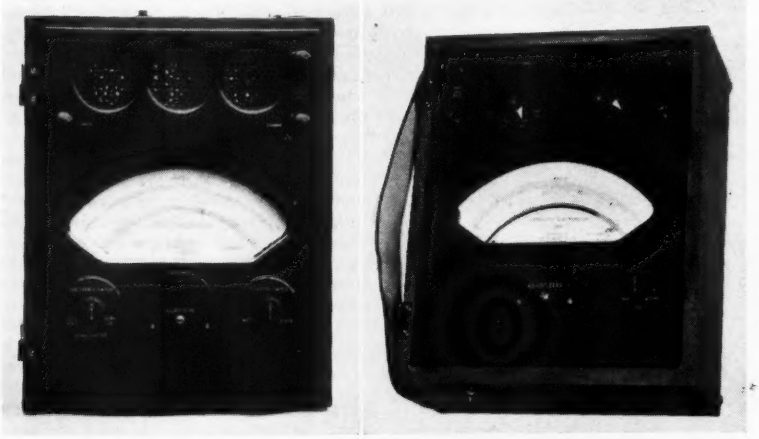
In some cases cabinet work this year will be so designed as to give receivers a particularly distinctive appearance, and there will be a tendency for the introduction of sets whose cabinets can be used as tables ("armchair" radio), bookcases, &c.



Interference suppression will again be prominent at the exhibition. This is one of the new Belling-Lee set lead suppressors

Meter-Testing Instruments

TO satisfy the requirements of the Electricity Commissioners in respect of "approved apparatus" for testing stations according to Sec. 2 of the Electricity Supply (Meters) Act, 1936, the Cambridge Instrument Co., Ltd., has produced a range of sub-standard dynamometer instruments, a standard d.c. meter testing potentiometer and a vernier potentiometer of extreme precision.



Left: Universal pattern dynamometer. Right: Multi-range wattmeter

The dynamometers, which are all of B.S.I. sub-standard grade accuracy, are supplied as wattmeters, voltmeters, ammeters and milliammeters, in addition to a wide-range universal instrument. A high grade nickel-iron alloy has been employed and the double pivoted moving system is air-damped; a knife-edge pointer and scale mirrors are incorporated. An air-tight metal cover encloses the entire system and a well ventilated outer teak case houses the range resistances.

Multi-range Models

The wattmeter is suitable for use on d.c. or a.c. of any frequency up to 150 cycles per second; automatic compensation is unnecessary. Two voltage and two current ranges are provided, which will permit full scale deflection with the power factor as low as 0.25. The current ranges are controlled by a rotary switch which may be operated on load, while another switch is provided for reversing the moving coil when the instrument is used on three-phase circuits; external multipliers may be used.

There is also a multi-range wattmeter which will carry out all the tests specified on meters up to 5 A, or (when used with a suitable current transformer) will cover the entire range of meters with the minimum number of tappings on the transformer primary. This instrument has four current and four voltage ranges, each set controlled by a simple switch which can be moved on load.

A new reflecting dynamometer wattmeter has now been produced for laboratory calibration of sub-standard instruments. Its scale, which is 2.5 metres long, is in three consecutive strips and the optical index spot can be read to 0.2 mm. in daylight. A universal pattern has also been developed.

The voltmeters may be used up to 750 V on d.c. or on a.c. not over 150 cycles per second. Low- and high-range patterns are available and a range switch, which may be operated on load, is fitted on three-range models; special instruments for use at frequencies up to 1,000 cycles per second can be supplied.

Among ammeters for d.c. or for a.c. up to 150 cycles per second are multi-range instruments fitted with a switch which can be operated on load, and the a.c. ranges may be extended by the use of a specially designed current transformer. Milliammeters can be supplied with any single range between 10 and 650 mA and, if desired, may be fitted with separate pairs of terminals for the fixed and moving coils.

The universal dynamometer combining the functions of a single-range ammeter, a three-range voltmeter and three-range watt-meter is suitable for d.c. or a.c. up to 150 cycles per second. The meter-testing potentiometer is of robust construction and an engraved dial switch gives steps of 0.1 V on the normal range, while the lower values are covered by a large disc engraved in millivolts, each having five sub-divisions. A rolling contact, designed to eliminate wear, is moved by this disc over a uniform wire and a rotary switch gives a one-tenth range. Current is taken from a 2-V accumulator; temperature compensation is effected by a calibrated circular slide wire and the galvanometer key makes two successive contacts.

Potentiometer with standard cell slide and two-way switch

On the vernier potentiometer potential is selected by three dials controlling one 19-way and two 101-way switches, giving steps of 0.1, 0.001 and 0.00001 V respectively on the normal range; mechanical clicks ensure correct contact, the measuring coils are constructed of manganin and the switches and coils can be submerged in an oil bath.

Testing Moving-coil Instrument Magnets

By C. W. Collins and E. H. W. Banner, M.Sc., M.I.E.E., F.Inst.P.

THE general plan of instrument manufacturers is to compare their magnets against some arbitrary standard. The figures resulting from the test have no actual value and give no indication of the actual performance of the magnet. An approach to a scientific measurement is made, usually by magnet manufacturers, by the use of a ballistic galvanometer or fluxmeter with a loose search coil. This test gives total flux, but in a form which is not of much real use. If the coil is removed from the neutral position, a reading may be obtained which is more than twice that indicated when the coil embraces the air gap only. Both results may be correct, but unfortunately neither is useful from the instrument designer's point of view, although comparative to the magnet maker, for the reason that they do not represent working conditions.

The instrument designer requires to know the flux through the actual coil, using the actual iron circuit as it is to be employed in the instrument that is required. This figure will be less than that obtained at the neutral position; measurements made in the air gap of the magnet are useless, as the distribution of flux is completely altered from that obtaining when the core is in position.

Search Coil

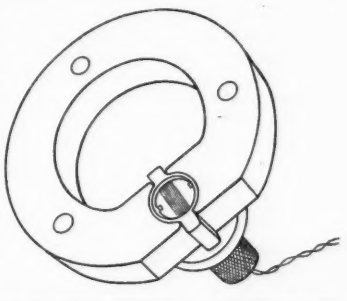
In order to carry this into effect a search coil is made comprising any convenient number of turns, but occupying the same space, in each dimension, as the moving coil to be used in the instrument. This coil is fixed in position relatively to a core of the type to be used, by some non-magnetic material, and the whole is enclosed in an outer non-magnetic cover so that when fixed rigidly on the base the magnet will slide over guides into its correct working position, the coil lying with its axis coincident with the magnetic axis.

Relative movement between the coil unit and the magnet is required for a test; it is immaterial whether the coil is removable or the magnet. The instrument used may be a ballistic galvanometer or a fluxmeter; the former is more accurate, but is less rapid in operation and needs to be permanently set up with a lamp and scale, while the fluxmeter, particularly if of the modern quick-acting and stable type, is easier to use by semi-skilled operators and, in general, can be sufficiently accurate for works use.

It will be appreciated that the iron core is in constant relationship to the coil, and when the coil and magnet are separated the core remains with the coil and not with the magnet. This is of no consequence; provided that the iron has no retentivity, the flux through the coil will be zero when the coil and magnet are separated, while when in position the total useful flux threads the coil. By useful flux is meant that flux which threads the actual instrument coil of the type for which the testing unit is designed. It is immaterial whether the coil or magnet is removable, as has been stated; it is also immaterial whether the coil and magnet are separated to make a test, giving the flux collapse to zero, or quickly brought into relationship, giving the rise of flux from zero to maximum.

From the galvanometer or fluxmeter calibration and the number of turns on the search coil, the total useful flux is calculated. In the same way, when the coil area is known, the flux density in gausses can be calculated. These are the actual figures of use to the instrument designer, and serve equally as comparison figures.

The useful flux in the magnet for a given type of instrument will be the flux linking the coil, which is often less than half that through the neutral of the magnet, owing to the heavy leakage flux above and below the air gap and along the magnet surface toward the neutral section. For an approximate value of the pole face density to be calculated, the total coil flux, as already determined, can be divided by the surface area at the poles. The resulting value will usually be less than that for the coil, on account of the pole arc being longer than the coil width.



General arrangement of testing unit

As an example of the use of this method with a particular instrument, where the magnet proportions were largely fixed but capable of some modification with regard to section and air gap, the following figures are given. Loose search coil and fluxmeter, coil removed from neutral section=6,800 maxwells. Comparative test by instrument maker=48 arbitrary units. Test by new method, actual lines in working gap and as required for torque calculations=2,050 maxwells. This last figure alone is of real design value as well as being comparative.

The illustration shows the general arrangement of the testing unit in one form.

German 125-kV Oil-filled Cable

SOME particulars have recently been made available of the 125-kV cable supplied last year by the Siemens-Schuckertwerke, Berlin, to the Aluminium-Industrie Gesellschaft, Neuhausen, Switzerland, in connection with the extension of the Rheinfelden Aluminium Works in Baden. This is the first oil-filled cable for operation at 125 kV so far made in Germany, and it connects the high-voltage overhead lines with the rectifier house, direct entry not being possible owing to the situation of the building in the works grounds. The length of the cable line is about 1,650 ft., and the laying of the six single-core cables side by side had in parts to be carried out under difficult conditions. The use of a single-core cable for each of the phases of the three-phase system permitted the employment of manufacturing lengths of 1,650 ft., thus rendering connecting boxes unnecessary.

An exceptionally high standard of reliability was demanded, since a failure of the supply for any length of time might lead to solidification of the electrolytic baths. Consequently, current is fed from two different works by two different overhead lines, which rendered it necessary to lay two separate groups of cables. The cross-section of each group is sufficient to enable it to carry the full current alone in case of failure of the other group. The incoming power is distributed through expansion circuit-breakers, by means of which the cables can be switched over from one overhead line to the other.

The cable has a hollow aluminium conductor consisting of two layers of wires of flat section which are stranded round an inner spiral. An active cross-section of 0.147 sq. in. was selected in order to ensure that the cable was proof against thermal short-circuit, although one having a cross-section of about 0.078 sq. in. would have been sufficient. The thickness of the insulation is 0.53 in. The lead sheath is provided with a protective coating against corrosion and a spirally wound layer of "Aldrey" tape as a protection against internal pressure. To protect this strip and the lead sheath from the effects of the stray earth currents prevalent in aluminium works, and against chemical attacks, a further coating of bitumen-covered india-rubber tape is provided. Then follows a layer of flat "Aldrey" wire armouring, the whole being enclosed in a final protective coating.

The cable-ends terminate in 132-kVA indoor boxes with non-cemented "Repelite" insulators. The two groups of cables thus necessitated at each end six single-wire end-boxes. Since condensed moisture from the air must be reckoned with, the flash-over length of the insulators was increased from 39.5 to 47.5 in. The cable end-boxes in the rectifier house had to be mounted opposite the transformer terminals on a wall at a height of 32 ft. 9 in. For the reception of the oil, equaliser vessels are provided at both ends of the cable. The vessels are erected near the cable end-boxes and are connected to the earthed housings of these by piping.

The oil pressures at the rectifier end of the cable vary from about 10 lb. per sq. in. at light load in winter to about 21½ lb. at maximum load in summer. Each cable is equipped with a pressure gauge at each end, arranged so as to give an alarm signal.

The quantity of oil flowing in and out of the 20-cell equaliser vessels between maximum and minimum pressure is about 2.65 gall, whilst in the case of the five-cell cushioning vessels the volume flowing is only about 0.066 gall. A storage vessel is capable, in case of emergency, of supplying oil through permanently laid piping with cocks, thus providing a reserve to maintain operation in case of a leak developing in the lead sheath of the cable.

The cables are laid in trenches 3 ft. 3 in. in depth; they are embedded in sand, separated by bricks and covered with reinforced concrete slabs. In addition to the six 125-kV cables three pilot cables, three low-voltage cables and two 6-kV cables were laid in the same trenches.

The Purchase of Undertakings.

By G. V. Harrap, A.M.I.E.E.

THE proposals to reorganise the electricity supply industry have led to many discussions regarding the terms under which electricity undertakings should be purchased, and the columns of the ELECTRICAL REVIEW have reported the action contemplated by various types of these undertakings in view of the legislation which is now imminent.

Much has been written about the injustice or otherwise of the terms proposed in the McGowan Report for the acquisition of company and local authority undertakings. In the case law of this country will be found many instances of disputes over the construction of the terms of purchase of company undertakings. Since it was originally contemplated that these undertakings should eventually revert to local authorities, there are not the same records of the purchase of undertakings belonging to the latter. When making pronouncements upon the terms of purchase suggested in the Government's recent proposals, regard has only been paid to the accountancy aspect, and to the apparent equity of the methods suggested. While it is not maintained that this limited outlook is wrong, I consider that greater weight would be given to the arguments, both for and against, if comparison could be made with the practice pursued in similar types of purchase.

Since the proposals deal with both company and local authority undertakings, it is as well to avoid past happenings in this connection, and concentrate on other types of undertakings, or else mention similar undertakings operating in other countries. Non-statutory companies immediately suggest themselves for this country, but it will be found that their terms of purchase have little or no relation to the statutory terms prescribed in the Electricity (Supply) Acts. Their operations are carried out under regulations specially made by the Electricity Commissioners, but even so, they are precluded from many of the advantages and limitations of authorised undertakers. In addition, they have no monopoly of supply, no power to break up streets, and no limitation of profits, and hence it could be said that their terms of purchase are purely a matter of commercial business principles.

The McGowan Committee's Proposals

Under these conditions, it is obviously desirable to leave out of consideration in this article any of the terms applicable to any type of undertaking in this country, and concentrate upon what has occurred elsewhere. Before doing so it would perhaps be as well to mention briefly the appropriate terms at present under discussion up and down the country. The Committee on Electricity Distribution recommended that the terms of purchase for a local authority undertaking should be the fair value of the physical assets, including assets purchased out of revenue; *i.e.*, cost less depreciation. In the case of company undertakings the basis of purchase should again be the fair value of the assets, but with the addition of compensation for loss of future profits. No additions were to be made to the cost of a local authority undertaking in respect of contributions from local rates in previous years, nor of any right to contribute to these rates. Additions re to be made to the cost of company undertakings for goodwill, to cover the unexpired franchise in the case of distribution companies, and the perpetuity rights of power companies. Allowance was also to be made for unfructified capital expenditure incurred in the three years prior to purchase, but some deduction was to be made in view of the limitation of profits proposed by the Committee for undertakings continuing to operate.

The terms of purchase as given in the Proposals of the Minister of Transport will be found in Appendix "B," part 1, page 22, and it will be seen that they follow the suggestions of the Committee. With regard to depreciation, the new Scale of Depreciation (Purchase of Electricity Undertakings) Special Order, 1937, made by the Electricity Commissioners in March, and now awaiting confirmation, should be consulted. A study of the methods adopted elsewhere should make it possible to give fuller consideration to the terms recently proposed for undertakings in this country.

American Practice

Most of the area of the United States is covered by public utility undertakings which are incorporated companies, in some instances operating over the whole of a State. Very few of the major municipalities operate undertakings of their own, although some of the small local authorities and town boards in sparse areas do so. The provisions regarding purchase are contained in the Public Service Law and the General Municipal Law, Chapter 48, Article 4, and Chapter 281 respectively. Under these laws, any one type of undertaking can purchase any other type of undertaking. As is well known, it is a common feature of American supply for one company to own many other subsidiaries, both supply and otherwise. In these cases the purchase is effected without any restriction and the transfer of the assets becomes a pure commercial transaction. As in this country, non-statutory undertakings do operate, but in the United States it is usually in the sparser areas of the country. Normally, any surplus power from a private generating plant is bought in bulk by a public utility company, and it will be found that industrial concerns very rarely distribute electrical energy, even if their memoranda of association permit them to do so.

Methods pursued in other countries

All municipalities are empowered to set up a public supply of electrical energy, and for this purpose they may purchase the undertakings of public utility companies within their jurisdiction. If it will add to the technical efficiency of a scheme of electrification, a municipality may also purchase the undertaking of another municipality, and it is not necessary for the two areas to be contiguous. Furthermore, if the municipality finds that it can economically supply areas outside its own boundaries, not within the jurisdiction of another municipality, it can purchase such part of a public utility company's undertaking as will permit of this being done. In all the above cases no provisions are enacted by the General Law; it is only necessary for a municipality to pass a local law embodying the terms of purchase and all other details ancillary to the transfer or setting up of the undertaking. The municipality is left to negotiate the most favourable terms it can obtain, but before taking any action the proposals must be submitted to the electors at a general election or a special election called for the purpose of giving approval to the purchase and its terms. Provisions similar to those appertaining in this country to an application for a Special Order are mandatory upon the municipality, but again it could be said that the purchase of a company undertaking by a local authority is left to the business acumen of the council and the electors.

The Irish Free State

The provisions relating to this matter in the Irish Free State are contained in Section 39 of the Electricity (Supply) Act, 1927, under which an Electricity Supply Board was set up to co-ordinate generation and distribution and given powers to acquire other undertakings and act as an authorised distributor. By sub-section 4 it is enacted that all property and assets of the former undertaking, together with all debts and liabilities, shall vest in the Board. In the case of a local authority the Board takes over all capital loans, mortgages and charges outstanding at the date of the vesting order. It will be remembered that the McGowan Committee rejected this basis in its recommendations because of the various rates of liquidation adopted by different undertakings. It is of interest to note that the Board has to repay to the local authority any amounts paid to the undertaking from the local rates, after deducting all amounts contributed in relief of the rates.

In the case of undertakings not owned by local authorities the terms of purchase are to include the fair value of the undertaking as a going concern, together with interest at the rate of 5 per cent. per annum. Provision is made for the determination of the fair value to go to arbitration, and when it has been fixed the Board pays off all outstanding loans and capital charges before handing the residue over to the former undertaker. No addition is permitted for any increase in the value of the undertaking consequent upon the construction and operation of the Shannon Scheme and the e.h.v. transmission lines erected under the 1925 Act. No difference in treatment is given to company undertakings purchased by local authorities except that all such purchases must be made through the Board. This applies when a local authority undertaking takes over another of the same type.

An outstanding arrangement in electricity organisation is the control of an undertaking by the Board for a period of five years. Any type of undertaking may be taken over and run by the Board, in which case the profits earned are paid into an account for the undertaker, and if any losses are made these can only be debited against the undertaker to the value of the annual loss made in the years before the control was effected. The Board has to bear the loss additional to that determined above, and, if the undertaker desires it, the Board has to acquire the undertaking on the terms given above.

Northern Ireland

The Board set up by the 1931 Act of Northern Ireland has power, and intends to exercise that power, to acquire electricity undertakings. With the exception quoted below, the Board normally acquires all authorised undertakings within three years of the commencement of a development area. The exception is in the case of any undertaking not owned by a local authority, where if it can be proved that it would not be to the consumer's benefit that the undertaking should be acquired by the Board, the former owner may continue operation.

In the case of local authority undertakings the terms of purchase are similar to those in the Irish Free State, *i.e.*, the Board takes over all assets and liabilities and debts, but the acquisition does not include any purchase price. With company authorised undertakings the purchase price includes the fair market value of the material assets, together with an addition for goodwill, but modified by consideration of the existing tariffs and the right of a local authority to purchase the undertaking at some future date.

In the case of non-statutory undertakings the terms of purchase include the fair value of the assets at the time of acquisition plus an amount for goodwill. In connection with the latter, consideration is given to the fact that the undertaker has no monopoly of supply and is working under different conditions from an authorised undertaker. For the other types of undertaking, the goodwill is based on an estimate of the future rate of development having regard to previous progress, and the calculated profit is then averaged and a number of years' purchase at this figure determined. In all cases the assets are taken at their cost price and depreciated at a reasonable rate according to the life of the asset. This may sound rather vague, but it must be remembered that there is not yet in this country any authoritative provision for a scale of depreciation, although one is now in process of confirmation.

New Zealand

In New Zealand the Government took an early part in the development of electrical energy, and by the 1903 Act reserved to itself the right to generate electricity by water power. Companies and other bodies could use water power for the generation of electricity, but were prohibited from retailing it to any other persons, &c.

Some few private Acts have been passed enabling local authorities and companies to set up distribution undertakings, but most of the supply is in the hands of public Power Boards, which sell in bulk to the majority of local authorities, &c.

In view of the above conditions, there has not been the same necessity to legislate for the purchase of undertakings, and it will be found that there are only four companies in the whole of the country which hold any substantial powers of supply. They and the local authorities distributing on their own account are embodied in the Power Board areas, but are not subject to purchase. The companies do not operate in populous areas, but generate mainly for their own industrial purposes.

India

India is still in the stage of piecemeal development, and although a number of grid schemes have been put into operation, any co-ordination such as is contemplated in this country is a long way off, the conditions being very widely different. Some company undertakings are subject to purchase by local authorities after a period of years, and in these cases it will be found that the provisions regarding purchase are contained in the private Acts setting up the undertakings. These terms usually include the fair value of the assets at the time of purchase, *i.e.*, cost less an agreed scale of depreciation.

In view of the limitation of the perpetuity rights suggested in the Government's recent proposals, it is interesting to note the conditions obtaining in India under somewhat similar circumstances.

Undertakings are in the majority of cases licensed by local government (not local authority) order, although some of the larger companies, such as that operating in Calcutta, have obtained special Acts. Under the 1910 Act, as subsequently amended, a licence is held in perpetuity, subject to revocation and, in most cases, to compulsory purchase. The option to purchase, where it is a condition of the licence, first arises after a period not exceeding fifty years, and subsequently recurs at twenty-year intervals on the giving of two years' notice.

The purchase price is taken as the fair value of the assets, modified according to their condition at the time of purchase and depreciated according to the state of repair. Addition can be claimed for the fact that the undertaking is in working order, and furthermore, Section 7 (1) of the Act states that a proportion not exceeding 20 per cent. may be added on account of compulsory purchase. The actual percentage is usually contained in the licence itself, and is the subject of bargaining between the company and the local government at the time of granting the licence. In the case of revocation of the licence, no addition is made for loss of profit or the value of goodwill.

South Africa

Although there is an Electricity Supply Commission in South Africa its function is mainly the co-ordination of generation and the provision of main transmission lines for the giving of bulk supplies similarly to our Central Electricity Board. Its activities are mainly confined to the wholesale side of electricity supply, although some rural distribution is carried out in areas not covered by an authorised undertaker. Most of the local authorities have their own undertakings, so that there is little provision for the purchase of those owned by companies. The purchase of local authority undertakings has never been contemplated, and hence no comparative details are available.

Consideration of the above provisions for the purchase of undertakings in various countries shows that in most of them different conditions apply to local authority and company undertakings. Allowance appears to be made for goodwill in most cases, and, subject to various limitations, there is compensation for loss of profits. Local authorities, on the other hand, appear to be taken over as going concerns on payment of all outstanding debts with no compensation for the loss of rateable value to the city or the right to contribute to the relief of local rates.

Diesel Electric A.C. Ship Propulsion

A SYSTEM of a.c. transmission has been evolved by the British Thomson-Houston Co., Ltd., for use between a group of relatively high-speed Diesel engines and a relatively slow-running propeller, the scheme being particularly suitable for medium- and high-powered vessels of, say, 3,000 h.p. per shaft and upwards. One advantage of this system is that it is possible for all the main electrical machines to be of the synchronous type, the alternator being a salient-pole machine and the propeller motor of the synchronous induction class, which are robust and highly efficient types. The B.T.H. Co. and its associates have supplied 499,300 s.h.p. of this type of propeller motor in various vessels equipped with turbine electric drive.

The advantages of a.c. transmission for high-powered ships may be summarised as reliability and efficiency; low weight and compactness of electrical machines, and air gap clearance of the order of ¼ in. Even a major repair, such as rewinding, can be carried out within the space occupied by the machines themselves, deck openings or dismantling space being unnecessary.

High-speed Diesel engines reduce the headroom required and by using a number of relatively small engines many adjustments can be made on a faulty engine without causing even a momentary stoppage of the vessel at sea.

The alternators are made self-synchronising, and where six or more engines are used an entirely automatic load equalising arrangement can be provided, if required. The B.T.H. Co. has patented a method whereby all the alternators are kept in parallel under all conditions of speed, and during reversing operations main power contactors open and close on a dead circuit.

A further advantage of this system is that the power supply for engine auxiliaries whose duty varies with the speed of the engines, such as large scavenging blowers, lubricating pumps, &c., can be taken from the main propelling generators and maintained during manœuvring periods without having to transfer to another source of auxiliary power or specially transfer a main propulsion generator set to the auxiliary power circuit.

All the engines can be synchronised in a predetermined relative crank position, so minimising vibration, and this relative crank position of all engines will be maintained during a stoppage or during a manœuvring period.

It is generally accepted that from a purely propulsive efficiency standpoint a single screw vessel has a propulsive efficiency of 7 to 12 per cent. better than a twin screw vessel of the same size and form, but this factor is frequently sacrificed owing to the fear of a complete stoppage due to engine breakdown at sea. It is also generally admitted that many vessels are fitted with direct-coupled Diesel engines running at a higher propeller speed than that which is most efficient for the propeller. The electrical losses vary with the size of machinery and not more than 6 per cent. loss would be incurred in a single screw equipment of 10,000 s.h.p. and not more than 5 per cent. in a 30,000-s.h.p. twin screw equipment.

The adoption of electrical transmission makes it possible for the engine builder to standardise engines, while the generating sets can be distributed in different compartments, so avoiding subordination of passenger accommodation and location of public rooms to the requirements of the more orthodox propelling machinery.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

The Importance of First Aid

The problem of training employés in the practice of first aid is one which does not appear to have been seriously taken up by the various firms and undertakings connected with the electrical industry. Many of the larger firms have excellent ambulance stations in their works run by a trained staff, but is this enough?

The last annual report of the Chief Electrical Inspector of the Factories and Workshops Department shows that in 1935 there were 447 electrical accidents in factories during the year, and 23 of these were fatal. In 1936, however, there were 520 accidents and 31 were fatal. It is pointed out that there is no increase as a percentage owing to the greater number employed in the electrical trades, and that, compared with other trades, the figures are low. But the fact remains that no improvement has been made. The adoption of the following scheme might help to save lives.

Let us take the case of a large manufacturing concern with its own ambulance station. One of the men on the dynamo test bed gets a bad electrical shock and is rendered unconscious. Unless there is a first-aid man on the spot, someone goes to the ambulance station for assistance, but this may take five minutes or longer.

It is of paramount importance that artificial respiration is started at once, as every instant of delay is serious, and may even prove fatal. It is very easy to administer artificial respiration, but how many men really know how to at a moment's notice?

In all power stations, sub-stations and test beds full particulars are given on an illustrated diagram of how to give artificial respiration, but to give the correct treatment (and a man's life may depend on the correct treatment) it is necessary to practise before either a doctor or a skilled first-aid man. It should therefore be the duty of all test-bed engineers, and others likely to be exposed to this danger, to know not only how to apply artificial respiration but to be efficient in the treatment.

Then there is the question of the outside erection engineer; here, more than anywhere else, a good practical knowledge of first aid is essential. Accidents are likely to happen both in the erection and testing of the gear, not only from electrical shocks, but accidents to the body. A man may fall from an overhead line pole and break his leg, and in doing so sever the femoral artery. A man can bleed to death in four minutes if the bleeding is not stopped, which is an easy matter to an efficient first-aid man.

We are told in the figures just published that 55 per cent. of electrical accidents are burns. There are two great dangers from burns (1) shock to the human system and (2) blood-poisoning following a septic wound. Here, again, if the correct treatment is given these dangers can at least be lessened. In all accidents, a diagnosis having been made, the correct treatment is the important thing. But how often after an accident one hears somebody asking the question "Anybody got some brandy?" which, except in very special cases, is the worst thing a patient can be given.

Supposing a man has received an electric shock causing him to fall to the ground; in falling he may injure his head, causing concussion. To give a man in this condition brandy or any other spirit may cause compression, which in turn may be fatal. It is necessary to be an efficient first-aid man to be of any real use in an emergency.

I feel, therefore, that firms and supply undertakings should encourage employés who are engaged on work which is likely to be dangerous to take up first aid, by holding classes during the working hours. One lecture per week lasting about an hour with, say, half-an-hour for practice after the lecture, should be sufficient. Alternatively, extra pay might be allowed to men who hold the St. John Ambulance or other approved certificate, and who pass the examination every two years, the latter being necessary for efficiency.

First aid is also useful in the home and on the roads, more especially with the ever-increasing number of road accidents. The subject is extremely interesting, and in learning it the student gets a good knowledge of how the human body works.

August 17th. FIRST AID CERTIFICATE.

Electricity Supply for Railways

The outcome of the appeal made recently by the Birkenhead Corporation against a decision in favour of the Liverpool Corporation providing the L.M.S. Railway with traction supplies in Liverpool, with the ulterior purpose of transmitting and utilising those supplies to operate an entirely separate and disconnected railway in the Wirral, is but another example of the many crazy anomalies created by the 1926 Act. I imagine that most of the stalwarts who have argued that selected station owners do not occupy a favoured position in the supply industry which enables them to get down to prices which attract business along lines not open to authorities compelled to purchase their requirements from the grid must have their tongues well in their cheeks at the moment.

Presumably the Liverpool Corporation has obtained the business because it has been able to quote prices well below those offered by the Birkenhead Corporation, but it has to be remembered that Liverpool owns a base load station having low costs whereas Birkenhead purchases its requirements from the grid at increased cost and is at a commercial disadvantage when competing for business in what may be properly considered as "one and the same market."

It is to be hoped that advantage will be taken of the opportunity to put matters right which the above decision in the Court of Appeal undoubtedly foreshadows. The right sort of "White Paper" will probably tickle the majority of supply authorities to death. The idea of legislation which would authorise the C.E.B. to buy out all selected base load stations and compel all supply authorities to purchase their requirements in bulk at a uniform cost would eliminate all possibility of such a thing happening with the other Railway Companies and would automatically right many of the grievances which the distribution authorities cherish.

Logically, when undertakings derive their supplies from a common source it should be possible for any undertaking to

Electricity is used for lighting, cooking and refrigeration in the officers' mess at the Royal Army Service Corps (T.A.) camp at Hawkwell Park, Essex, special overhead lines being erected and the appliances installed by the County of London Electric Supply Co. The officers' messes at the Royal Engineers' camp at Rawreth, Essex, are similarly equipped

provide an unlimited supply of power within its statutory area at a lower price than could be quoted by any outside authority—irrespective of size—who would need to bear the costs of transmission, which should be quite sufficient to turn the scales in favour of the local undertaking. Otherwise, the C.E.B. in the first instance, then the local authority and finally the industry lose on the transaction while the consumer gains nothing worth talking about.

The benefits to be derived from a traction load on a national scale should be to the direct benefit of the grid and indirectly to those supply authorities which purchase therefrom, not as in the present case for the exclusive benefit of a particular Corporation and a single Railway Company. If we are to think along national lines let us have a national policy and legislation which prevent this sort of thing occurring at almost standard frequency.

JAMES RATCLIFFE,
Engineer and Manager.

Whitworth (Lancs), *August 12th.*

New Books

A Course in Electrical Engineering—Volume I. Direct Currents. By C. L. DAWES. (Third edition.) Pp. 751; figs. London: McGraw Hill Publishing Co. Price 24s.

By the time a textbook reaches a third edition its success has been fairly well established and the nature and arrangement of its contents have been more or less settled. The author's chief task is then to keep the material up to date. This stage has practically been reached with the present book, which represents what is usually included under electrical technology.

With nearly 600 pages devoted to the technology of direct currents, the author has been able to deal with his subject fairly exhaustively. In view of their great importance, however, motors deserve more than twenty-five pages in a book of this type, even with a special section devoted to speed control.

Following the appendices there are about 150 pages taken up with questions and problems. These 774 problems are in addition to the worked problems in the text, of which there are many; but we fail to find answers to the appended problems, which may be troublesome to the private reader. Many students will appreciate the inclusion of the Greek alphabet, with large and small letters, along with their names.

Students and others will find this a useful textbook on a subject of which the material is now fairly well standardised, the general treatment being quite satisfactory.

Fundamentals of Vacuum Tubes. By AUSTIN V. EASTMAN. Pp. 438; figs. 363. London: McGraw Hill Publishing Co. Price 24s. net.

While there is quite an extensive literature on vacuum tube circuits for radio, television and industrial purposes, really good books on the operation of tubes (or valves) themselves, as distinct from their circuits, are not so common. The present author has set out to remedy this and his book combines the basic theory and laws underlying the operation of all types of modern vacuum tubes for radio and industrial purposes, with accounts of their more common applications.

After three introductory chapters on types of tubes, electronic emission and symbols and notations the author "returns to his muttons" and gives us an excellent and lengthy chapter on diodes and their rectifier action which embraces high-vacuum diodes, tungar rectifiers, phanotrons, cold-cathode rectifiers, and mercury-arc rectifiers including the ignitron.

Following this are five chapters on triodes which relate respectively to class A amplification, relay action, class B and C amplification, oscillators, and modulation and demodulation. Chapter 10 describes the performance of multi-element tubes of the tetrode, pentode, variable-mu, semi-pentode, beam power, pentagrid, and dynatron types. Photo-sensitive cells form the subject of chapter 11, which discusses photo-electric cells, photo conductive cells, photovoltaic cells and thermo-couples. The final chapter deals with X-ray tubes, cathode-ray tubes, electron-ray tube, Dufour oscillograph, sweep-circuit oscillator, the magnetron, current-measuring tube, and low-resistance tubes for use in conjunction with the Duddell oscillograph. Two short mathematical appendices on the application of Fourier analysis to the solution of repeating functions complete the book.

The treatment of the book assumes the reader to possess a knowledge of the basic laws of d.c. and a.c., and of mathematics up to and including the simple calculus. The book is based on American practice, but it is limited thereby only in respect of the data given for American valves. Most of the work is of fundamental importance as the title indicates, and thus it is of general interest to all those concerned in any way with vacuum tube engineering. We cordially recommend the book to such, whether students or practising engineers.

The Objective Rate Plan. By W. F. KENNEDY. Pp. 83. London: Oxford University Press. Price 6s. 6d.

This is an account of the objective rate plan for reducing the price of residential electricity as applied by the Commonwealth & Southern Corporation and other American undertakings. Briefly, the plan consists in having two sets of tariffs operating simultaneously—the immediate rate and the objective rate. The former is the higher and is a mere continuation of the past practice of the undertaking. The objective rate is a lower set of prices to be applied to customers who have increased their consumption sufficiently over that of the base period, which is usually taken as the twelve months preceding the adoption of the plan. The plan has two possible applications, namely, as a temporary expedient to give a spread-over effect to a general price reduction, and as a permanent tariff scheme of a promotional character. There cannot be said to be much experience of its operation in the second capacity.

As a transitional expedient the object of the plan is to introduce a price reduction gradually and in such a way as to insure the undertaking against a loss in revenue. To illustrate the plan, let it be supposed that the existing price of electricity for some particular purpose is 1d. per kWh and it is proposed to reduce this to 0.8d. The immediate effect would be a fall in revenue, since the extra demand induced by the lower price would take time to develop. On the objective rate plan, consumers would be charged on the old rate until their consumption has risen sufficiently for their bill (calculated on the new rate) to equal or exceed the old one. There would thus be a transition period in which a consumer would be getting a certain number of free kWh, *i.e.*, all those in excess of the previous year's consumption up to the point where the new charge caught up with the old one.

When used in this way, as a spread-over for a new tariff, the aim would be so to increase consumption that at the end of (say) a three-year period the undertaking would be able to invoice all its customers at the objective rate without loss. In order to achieve this a balance must be struck between two opposites, since the objective rate must not be so low that the revenues under it will be inadequate, yet it must be low enough to promote increased consumption. The plan may also be used to safeguard the revenue when changing over to a different type of tariff.

To produce a book, albeit a small one, on a single electricity tariff may be regarded as an example either of American thoroughness or of American long-windedness. Perhaps it should be more precisely described as a by-product of the educational system—a degree thesis writ large. The production is certainly beyond criticism, and the only complaint that can be made with the matter is that a somewhat more critical appraisal might have been attempted. Thus, there appears to be no mention of an objection that strikes us as obvious, namely, that the plan could only be applied to consumers of at least a year's standing, and furthermore that new consumers would actually be encouraged to keep down their loads for the first year or so in order to get a small consumption in the base period.

Machine Drawing for Students of Electrical Engineering. By A. BRIDGE. Pp. 75; figs. 38. London: Blackie & Son, Ltd. Price 4s. 6d.

Students of electrical engineering have hitherto had a legitimate grievance that in studying machine construction and drawing—which is, of course, an essential subject for all engineering students—they have not had a textbook dealing with the machinery and equipment in which they are particularly interested.

The majority of elementary textbooks in this subject deal with steam-engine details, millwrights' work, and so on, and it has usually been assumed that only in the advanced stages is the student capable of dealing with such things as electric motors and switchgear. We, therefore, extend to this interesting book a very hearty welcome in that it gives to the student, almost from the very commencement of his studies, details of electrical machinery to draw. More than this, however, it presents these details in such a manner that, even if the student has not become familiar with them in the course of his practical work, the use of isometric drawings partly in section makes it almost impossible for him to fail to understand the exact form of the thing he is trying to draw. In this connection we would particularly commend the drawing of the 3-h.p. d.c. motor, shown in perspective, with a quarter of the yoke cut away, revealing the armature and showing the construction of the poles. This teaches quite as much as a dozen detail drawings in orthographic projection and is far more easily understood. (Incidentally, this drawing is reproduced in the form of a blueprint on the "jacket" of the book.) Not that the conventional drawing in orthographic projection is neglected. Indeed, the bulk of the exercises has to be worked out in orthographic projection, since all working drawings with dimensions, &c., are conventionally based on this system.

For the rest, the book follows along the usual lines, commencing with general instructions as to instruments, how to draw and finish off; systems of projection, geometry, and so on. It is when the actual drawing work is reached that the unique feature of the book is revealed, the various plates covering cable sockets, armoured cable glands, switchgear, starters, and, finally, seventeen deal with the 3-h.p. motor referred to above.

The author is to be congratulated on having produced a book on a well-worn subject from a new aspect. It can be recommended not only to elementary students of electrical engineering, but to all who are desirous of improving their knowledge of electrical engineering drawing.

Progress in Ontario

Growing interest in rural electrification

THE largest load ever carried on the combined systems of the Hydro-Electric Power Commission of Ontario was recorded last year when the total power generated and purchased reached 6,996,578,453 kWh, which is about 77,000,000 kWh above the previous record figure for the year before. This and other indications of the growth in the use of electricity in the Province are to be found in the Commission's report for the year ended October 31st last just published.

At the end of 1936 the Commission was serving 782 municipalities, including 26 cities, 98 towns, 275 villages and police villages and 383 townships. These are centred in the 40,000 square miles known as "Old Ontario," which comprises most of the settled area and forms about one-tenth of the total area of the Province.

Due to the reduction in the amount of secondary power sold, the yearly peak (*i.e.*, the sum of the peak loads of all systems) was 1,618,113 h.p. A statement giving the detailed operating reports relating to electricity departments of hydro municipalities puts the total number of consumers supplied at 561,252, which are classified as 474,337 domestic, 74,003 commercial lighting and 12,912 power.

R.C.A.F. photo.

An aerial view of the hydro-electric plant at the Chippewa-Queenston power canal, Niagara Falls

With the exception of fourteen suburban sections of townships known as "voted areas," the townships and 96 of the smaller villages are served as parts of 174 rural power districts. The demand for power by rural consumers during the year was unusually high, the aggregate load of 42,897 h.p. for October, for instance, being 15.3 per cent. above that for the same month of 1935. At the end of the year there were about 74,000 rural consumers, comprising farms and dwellings in various groups, receiving supplies, and another reduction in the service charge to farm consumers is expected to result in a further 10,000 applications for services being received during the current year. These applications will necessitate the construction of over 1,500 more miles of transmission lines.

Referring to the Commission's activities in accelerating rural development, the report declares that the most persuasive argument to the farmer is perhaps his knowledge of the benefits electrical service has brought to his neighbour. Once the progressive farmer installs electrical service he does not rest content until he has secured additional equipment to enable him to obtain fuller advantages from the service. This results not only in the reduction of the average cost of electricity to the individual farmer but also tends to secure lower rates throughout the district.

To explain the advantages of electricity to prospective rural consumers direct information is given by the Commission's employés at annual fairs and exhibitions and through the Press. Various Provincial Government aids by way of grants and loans minimise the cost of providing an electrical installation, and as a further inducement to potential consumers free electricity is offered for operating washing machines, pumps for household sanitary systems, and radio receivers. Special tariffs benefit long-hour users of electricity, particularly for soil heating and water heating. There are within reasonable distance from transmission lines about 65,000 farms which may be supplied, and so far nearly one-half have taken advantage of the facilities offered.

There was a relatively small increase in the capital invested in the older systems during the year. The extension of service lines in the little Long Lac district was the most important scheme carried out in the Thunder Bay system, the gold-mining undertakings there requiring some 13,000 h.p. in the next eighteen months. An additional unit for the Alexander plant on the Nipigon River is contemplated.

In the rapidly expanding Northern Ontario properties £1,413,984 was spent on extensions, mainly in the construction of high-voltage transmission lines and services for mines. To provide for further extension of these mining loads a storage dam is to be constructed on the Frederickhouse River which will materially augment the water supply for the Abitibi Canyon development, which is the principal source of power in the north. An additional 1,500-kVA generator was installed at the Rats Rapids development and a second generator was purchased for the Ears Falls scheme.

The total now invested by the Commission in power undertakings and hydro-electric railways is $297,864,135, exclusive of Government grants in respect of rural power district lines ($10,232,099) and the investment of the municipalities in distributing systems and other assets is $115,845,676, making a total investment of $413,709,814.

While the revenue from the Niagara system rose by $1,072,956 to $24,365,449, the cost of operation, maintenance and administration ($4,461,243) was only $82,982 higher. Equally satisfactory results were secured from the other systems, with the exception of the Eastern Ontario system, where during the exceptionally dry season a considerable quantity of power had to be supplied from outside sources. The Eastern Ontario costs are still, however, fully $100,000 less than the average for 1929-32. The drought also affected the Georgian Bay system and more power had to be transferred from the Niagara scheme.

The increases in operating revenues were obtained despite a marked reduction in the cost of power supplied in all but the Niagara system. Cancellation and revision of the Quebec contracts for purchased power have effected the saving of about $6,000,000, so permitting the Commission to make an end of withdrawals from the contingencies reserve applied in the reduction of cost of power. The savings also allowed the appropriation of $1,963,599 for stabilisation of rates and a provision for contingencies of $604,475. Commencing on November 1st, 1936, a reduction of $2.50 per h.p. was made for power supplied to the co-operating municipalities of the Niagara system. At October 31st last the Commission's total reserves were $90,285,772.

The work of the Commission's Testing and Inspection Department continues to grow. No fewer than 64,743 tests were made in the Routine and General Laboratory, and among the items inspected were transmission line materials, structural and reinforced steel, concrete, paint, lamps and electrical equipment generally. Methods of protecting wooden poles from ground line rot have been studied, and the sand-creosote collar treatment has been adopted on a large scale. Investigations into transmission line conductor breakages caused by vibration resulted in the development of a new type of damping device, while recently installed equipment for fatigue testing of conductors produced enlightening results relating to galvanised steel wire. Domestic water tank corrosion and concrete durability were among other subjects studied during the past year. An increase of 11 per cent. in the applications for approval tests was received by the Approvals Laboratory.

Since the reorganisation of the Electrical Inspection Department at the beginning of 1935 the volume of work handled has shown a decided improvement. Last year 92,845 permits were issued, representing an increase of 9,930, while 148,598 inspections (6,994 increase) were made.

Of the fires reported to the department last year twenty were found to have been due to electrical defects—eight more than in 1935. Of these seven were classified as having originated from armoured cable, three from badly made joints and two from flexible cords being used as circuit wires. The number of persons killed by shock (six) was the same as in the previous year.

British Overseas Electrical Trade

Improvement still continues

DESPITE a decline of nearly 18 per cent. in shipments of electrical machinery as compared with the preceding month, exports of electrical equipment generally continued their upward trend during July and at £1,545,547 were £30,238 higher than in June and £207,412 above the July, 1936, figure, though slightly below the highest total so far recorded this year, *viz.*, £1,594,561 in April. Seasonal activities are to a certain extent responsible for the state of the electrical machinery market, but there appears to be some slackening in the demand for the heavier type of equipment, purchases of generators, for instance, being about 34 per cent. below the total for the corresponding month last year.

With the exception of submarine telegraph and telephone cables (always a variable factor) and house service meters, the Board of Trade returns relating to exports of electrical goods and apparatus all show healthy increases. Reference to our smaller table shows that the biggest improvement has been in the "other insulated wires and cables" section, the total for which (£322,002) is £130,388 above the corresponding figure for July, 1936. As will be seen from the following analysis (the July, 1936, figures being in parentheses) increased shipments to South Africa and Australia contributed largely to this improvement:—

Rubber-insulated wires and cables.—South Africa, £37,210 (£28,986); British India, £17,438 (£13,295); Australia, £43,451 (£30,004); New Zealand, £8,464 (£10,231); other British countries, £23,257 (£12,767); and foreign countries, £20,164 (£9,138).

Wires and cables, insulation other than rubber.—South Africa, £47,047 (£24,622); British India, £18,062 (£14,293); Australia, £43,756 (£20,713); other British countries, £34,241 (£15,731); and foreign countries, £28,912 (£11,924).

There seems to be a growing appreciation of the high quality of British radio apparatus, of which all classes show increased exports. An analysis of exports of electrical goods and apparatus as a whole, as given in our larger table, shows that Australia, South Africa, British India, and New Zealand are still the largest individual purchasers, while the expansion in the Chinese market is encouraging. Argentina, Brazil, Denmark, Spain, Hong Kong and the Channel Islands are the only countries whose imports of British apparatus show declines. Trade with France is still improving.

Australia practically doubled its imports of our telegraph and telephone apparatus (other than radio) taking £51,937 worth, as compared with £26,506. This was, however, offset to a certain extent by a decrease from £25,838 to £9,830 in the exports of equipment in this class to Argentina. Shipments to South Africa were valued at £21,300 (£27,049); other British countries, £48,738 (£38,514); and other foreign countries, £44,388 (£41,809).

Imports, while not reaching the £433,587 recorded in April, at £423,999, were £13,848 more than in June and £44,708 more than in the corresponding month of last year. Slightly less lighting and unenumerated equipment was brought into this country and the largest increase, as in exports, appears under the heading "other insulated wires and cables," namely, from £36,562 to £51,545

Germany once more heads the list of supplying countries,

EXPORTS AND IMPORTS DURING JULY

	Exports. July 1937.	Exports. Inc. or dec. compared with July, 1936.	Imports. July 1937.	Imports. Inc. or dec. compared with July, 1936.
Submarine telegraph and telephone cables	£5,993	− £8,884	*	—
Telegraph and telephone wires and cables (not submarine)	69,109	+ 20,997	*	—
Other insulated wires and cables	322,002	+ 130,388	£51,545	+ £14,983
Radio receivers, not radiograms (excluding valves)	26,952	+ 9,064	16,219	+ 1,027
Radio transmitters (excluding valves)	43,908	+ 19,455	*	—
Radio valves	43,214	+ 11,628	21,112	+ 5,329
Other radio parts and accessories	55,909	+ 22,486	84,971	− 5,756
Telegraph and telephone apparatus (other than radio)	176,193	+ 16,477	*	—
Electric carbons	*	—	12,138	+ 2,910
Incandescent lamps	65,011	+ 2,820	16,582	+ 2,625
Other lighting apparatus	53,166	+ 2,858	47,698	− 1,177
Primary batteries	19,243	+ 3,631	*	—
Accumulators	45,096	+ 8,927	*	—
Electric cooking and heating apparatus	27,618	+ 7,129	*	—
House service meters	15,965	− 2,812	*	—
Other electrical instruments	20,345	+ 1,444	30,782	+ 9,376
Unenumerated electrical goods and apparatus	153,204	+ 24,581	76,431	− 325
Electric generators up to 200 kW	24,099	− 4,110	*	—
Electric generators over 200 kW	7,018	− 11,414	*	—
Electric motors	126,965	+ 10,069	30,823†	+ 9,136
Convertors and transformers	48,002	− 55,400	*	—
Starting and controlling gear for motors	31,206	− 32,873	*	—
Switchgear	122,178	+ 17,248	*	—
Other electrical machinery	21,005	+ 8,650	22,963	+ 6,118
Electric vacuum cleaners	22,146	+ 5,053	12,735	+ 462
Total	£1,545,547	+ £207,412	£423,999	+ £44,708

* Not classified separately. † Not railway and tramway motors.

the United States giving place to the Netherlands as the second largest supplier. Below are the actual figures:—

From British countries, £10,448 (£14,968); Germany, £94,407 (£72,879); Netherlands, £82,933 (£68,346); Belgium, £25,246 (£19,701); France, £9,073 (£8,235); Switzerland, £20,821 (£19,478); Austria, £5,420 (£6,624); United States, £82,619 (£85,529); and other foreign countries, £26,871 (£32,726).

During the first seven months of the year electrical imports were valued at £2,804,196, an increase of £461,173 over the corresponding period of 1936. For the same period electrical exports increased by £1,790,908 to £10,249,542.

Statistics are not available for a complete analysis of imports and exports numerically and by weight, but the following figures relating to exports are given:—Radio receiving sets, 5,969 (2,986); radio valves, 163,757 (94,922); electric lamps, 1,984,877 (1,934,404); house service meters, 14,395 (15,805); generators, 131 (343) tons; electric motors, 907 (781) tons; and other electrical machinery 1,259 (1,777) tons.

BRITISH ELECTRICAL EXPORTS DURING JULY

Destination.	Goods and apparatus July, 1937.	Inc. or dec. compared with July, 1936.	Electric generators, July, 1937.	Inc. or dec. compared with July, 1936.	Electric motors, July, 1937.	Inc. or dec. compared with July, 1936.	Other electrical machinery, July, 1937.	Inc. or dec. compared with July, 1936.
Irish Free State	£45,274	+ £14,130	*	—	*	—	*	—
Channel Islands	11,575	− 1,234	*	—	*	—	*	—
Union of South Africa	186,303	+ 17,486	£6,434	+ £779	£29,939	+ £13,698	£61,191	− £66,473
British India	104,292	+ 7,079	3,577	− 702	15,831	+ 3,793	32,861	− 8,289
British Malaya	29,622	+ 9,015	*	—	*	—	6,088	− 3,444
Ceylon	11,182	+ 4,532	*	—	*	—	*	—
Hong Kong	8,544	− 1,589	*	—	*	—	*	—
Australia	194,090	+ 61,215	4,113	− 8,380	14,958	− 248	36,817	+ 23,197
New Zealand	103,357	+ 32,866	*	—	11,800	+ 6,072	11,692	− 3,031
Canada	20,991	+ 12,531	696	− 3,255	6,512	+ 1,728	1,814	− 312
Other British Countries	75,470	+ 30,742	8,107	+ 2,308	14,472	+ 4,126	26,445	− 2,671
Sweden	10,663	+ 4,005	*	—	*	—	*	—
Denmark	18,575	− 10,038	*	—	*	—	*	—
Netherlands	12,359	+ 23	*	—	*	—	3,385	+ 1,897
Belgium	12,340	+ 1,850	*	—	*	—	*	—
France	23,151	+ 12,391	*	—	*	—	4,289	+ 1,654
Portugal	9,334	+ 1,823	*	—	*	—	*	—
Spain	1,216	− 2,278	*	—	*	—	*	—
Italy	7,608	+ 6,456	*	—	*	—	*	—
Greece	6,467	+ 4,459	*	—	*	—	*	—
Rumania	15,787	+ 10,477	*	—	*	—	*	—
Egypt	8,813	+ 450	*	—	*	—	1,975	+ 1,344
China	45,248	+ 36,354	*	—	*	—	3,496	+ 1,667
Brazil	11,775	− 4,953	*	—	*	—	*	—
Argentina	36,079	− 5,760	*	—	*	—	1,965	+ 546
Other Foreign Countries	132,813	+ 28,157	8,190	− 6,274	33,153	− 19,100	30,373	− 8,450
Total	£1,142,928	+ £270,189	£31,117	− £15,524	£126,965	+ £10,069	£222,391	− £62,375

* Not classified separately.

But for a decline of £66,473 in "other electrical machinery" shipped to South Africa, the total value of exports of electrical machinery would have been much the same as for July, 1936. Generating plant exports to Australia, Canada, British India and "other foreign countries" were less, but increased shipments of "other electrical machinery" to Australia more than balanced this. In spite of a fall of £19,100 in sales to "other foreign countries" electric motor imports are £10,069 up on the total for July, 1936.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

The B.I.F. Poster

The accompanying illustration shows the poster which has been designed by Mr. Tom Purvis for the 1938 British Industries Fair. It will be noticed that Britannia's head, which has been a feature in previous years, is omitted and greater prominence is given to the key, the emblem of the Fair, which represents the key to trade.

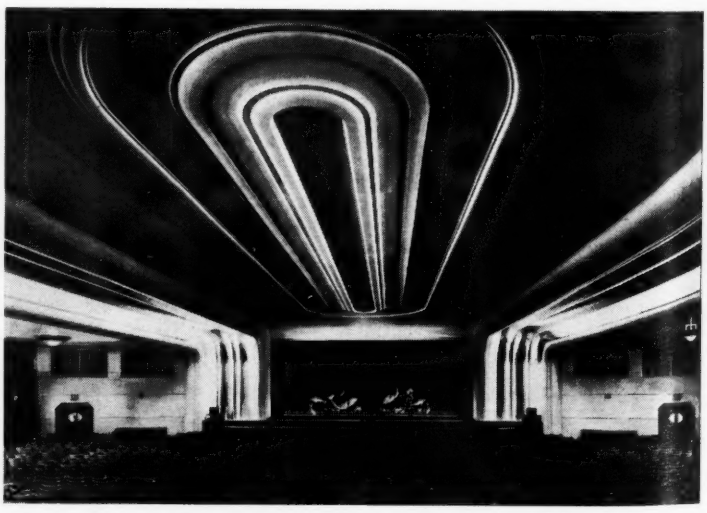
The poster for the 1938 British Industries Fair

Co-partnership Scheme

The annual meeting of the co-partnership and hospital and benevolent fund of the Mid-Southern Utility Co. was held at Aldershot on August 11th, when Mr. R. W. Edwards (chairman and managing director), said that the report and accounts showed record figures, with the exception of a small decline in the membership. The rising prices of coal and other materials, with an inevitable increase in the price of gas, would, however, mean a reduction in the bonus for next year. With regard to the savings fund, members had put by an amount now exceeding £30,000. Mr. Edwards also reviewed some important steps in the company's progress, and, in referring to the Government's distribution proposals, said that the company was alive to the far-reaching possibilities of the situation and would take every step to secure appropriate recognition. Meanwhile, development in the first half of this year had been marked by an increase of 44.4 per cent. in kWh sold within their mid-southern territories alone.

A Concert Hall Lighting Installation

Bridlington's new Grand Pavilion concert hall was opened on July 12th and takes the place of the old Grand Pavilion erected on Princes Parade in 1906 and demolished in 1936. The auditorium is of the stadium type, having the rear portion of the floor raised and raked several feet higher than the main floor. The lower floor can be converted into a dance hall to accommodate 300 persons. Fully seated, the whole floor will accommodate 1,700, with a clear view of a stage having a proscenium opening of 40 ft. in width. The stage is fitted with every kind of modern appliance, including Holophane colour-lighting equipment consisting of three four-colour battens, a foot-light, wingflood trolley units, cyclorama lighting and the latest type of four-colour dimmer switchboard with twenty-eight control ways. Holophane, Ltd., also provided four magazine-type arc spotlights, two being used on the stage and the others from chambers beneath the ceiling at the back of the hall. The main feature of the auditorium is two double Holophane moulded contour lighting coves which are carried along the ceiling from the rear of the hall to drop vertically on each side of the proscenium. The fibrous plaster contours extend between each pair of coves and were designed by the company and finished in silver. The coves carry over 460 ft. of contour lighting troughs accommodating 460 100-W and 40-W lamps with amber and coral-pink colour filters. The lighting unifies the coral pink and silver basis of the decoration. The trough lighting is controlled by a motor-driven dimmer actuated by push-buttons duplicated at each end of the hall and arranged to allow the lighting to be switched full on in case of panic. Four 6-ft. diameter indirect bowl units serve the two wings of the hall. The café, buffet and a very fine vestibule and main entrance are also lighted by Holophane fittings. The most striking feature of the auditorium is the proscenium curtain by Holophane in black velour with an appliqué design of an underwater scene replete with fish, crustaceans and an effective array of large sequins representing bubbles. The building was designed by Mr. P. M. Newton, architect of the Bridlington Corporation, and the rest of the electrical work was carried out by W. T. Drabble, of Bridlington.



The auditorium of the new Grand Pavilion, Bridlington

Registered Electrical Contractors

At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors the following applications for registration were accepted:—

Eyre & Harrison, Northwich.
Anthony & Roberts, Burnage, Manchester, 19.
Town-Ramsden, Halifax.
W. L. R. Howes, Ltd., New Cross, S.E.14.
H. Southey & Co., Hornsey, N.8.
H. L. Thompson, Hull.
Hindle Smart & Co., Ltd., Northenden, Manchester.
Turners (Epsom), Ltd., Epsom.
Turners (Esher), Ltd., Esher.

At the same meeting one application was declined.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the August 1st cost-of-living figure (55 per cent. above the 1914 level) will not involve any alteration in the wages of workers in the industry on the third pay day in September.

Australian Electrical News

It is stated that there is the possibility of a shortage of electricity in the Sydney metropolitan area in 1939. The County Council has ordered a new generating unit for the Bunnerong power house which will cost about £1,000,000, but owing to the production of armaments the delivery of this plant (which is being manufactured in Britain) may not be made until early in 1939 and may not be ready for use until the beginning of the winter. A suggestion that a second set of turbo-alternators should be ordered so as to be available for possible replacements is being considered by the County Council.

The general manager of the Sydney County Council (Mr. Forbes Mackay) is asking that a conference of all electrical interests throughout the State shall be convened to initiate a campaign urging an increase in the use of electricity.

The electrical engineer of Goulbourn (N.S.W.) recently stated that the position of overloading the present electricity supply had become so acute that he was seeking permission to refuse further applications for connections to the a.c. mains; to restrict the hours of sewage pumping; and to restrict the supply to the flour and woollen mills. This restriction, it is thought, will remove some of the overloading, and will permit the plant to operate without undue risk of failure. Application was made over twelve months ago for additional generating plant, but this was refused by the Electricity Advisory Board, which assumed that the grid system would be accepted.

The Standards Association of Australia has drawn up a set of safety regulations for application to electrical equipment for domestic purposes, the chief articles dealt with being toasters, jugs, grillers, kettles, saucepans, irons, radiators and immersion heaters. The new regulations have been drawn up

at the request of the Electricity Advisory Board, which is concerned with ensuring safety against fire and shock to the user. This follows the importation into the country of quantities of Japanese equipment, much of which is of very poor quality.

Sales of household electrical equipment have expanded during July owing to the coming in of cold weather—Perth has experienced one of the coldest spells for years. A building boom in Western Australia continues to keep electricians busy.

Electrical Situation in Greece

Despite considerable agricultural and industrial development, the economic position of Greece since 1932-33 cannot be said to have improved as much as external appearances indicate, states Mr. S. R. Gordon, Commercial Secretary at Athens, in his report on economic and commercial conditions in Greece prepared for the Department of Overseas Trade (Stationery Office, 1s. 6d. net). Though predominantly an agricultural country, Greece has been paying close attention to the development of her industries in the last few years, the value of production increasing from 6,062 million drachmae (546 drachmae to the £ sterling) in 1931 to 9,913 million drachmae in 1934. Of these amounts electricity was responsible for 690 million drachmae in 1931, as against 720 million drachmae in 1934. Since 1934 there has been an increase in this rate of development. An instance of the interest being taken in the mining industry is shown by the development of the bauxite deposits. In 1934 this mineral was not in the export list, while in 1936 it was exported to a value of 41 million drachmae, chiefly to the United Kingdom and Germany.

Foreign trade continued to increase. Of the total value of Greek imports, which rose from 8,431 million drachmae in 1933 to 11,808 million drachmae in 1936, 22.5 per cent. was from Germany and 16 per cent. from the United Kingdom. Exports increased from 13,572 million drachmae in 1933 to 19,180 million drachmae in 1936, and of this amount Germany took 36 per cent., U.S.A. 14 per cent. and the United Kingdom 12 per cent.

As the industrial development of Greece is not very advanced her imports are many and varied. Under the general heading of metals and articles in metal, the United Kingdom exports to Greece have decreased considerably and will continue to decrease until such times as the clearing system and import restrictions are modified or abolished. Every manufactured commodity in this category is affected and the trade is passing into the hands of Germany. The following table, extracted from the report, gives the value of the principal electrical imports in 1936:—

	(In millions of Drs.)
Electric lamps—	
Total	18.3
From Germany	7.7
„ Hungary	4.8
„ Austria	2.9
Dynamos and electric motors—	
Total	23.5
From Germany	13.6
From Austria	6.2
„ Sweden	1.8
Instruments and apparatus of applied electricity—	
Total	89.1
From Germany	68.4
„ United States	10.9
„ United Kingdom... ...	4.6
Wireless telegraphy and telephony machines and apparatus—	(In millions of Drs.)
Total	6.3
From United Kingdom... ...	3.2
„ Germany	0.9
„ United States	0.9
Wireless receivers—	
Total	22.7
From United States	13.8
„ Netherlands	4.5
„ Germany	2.3
„ United Kingdom... ...	1.0
Electric insulators—	
Total	27.1
From Germany	22.7
„ United Kingdom... ...	2.9

E.L.M.A. Activities

A two-day conference on electric lighting in works and offices is being held at the Mechanics' Institute, Bridge Street, Bradford, on September 21st and 22nd, under the auspices of the Bradford Branch of E.L.M.A. The conference will be inaugurated by the Lord Mayor of Bradford (Ald. G. R. Carter), and papers will be read by Messrs. W. J. Jones, J. W. Howell, H. Lingard and J. N. Aldington. On September 23rd visits will be paid to a number of well-lighted works in the Bradford area. Requests for reservations for the conference should be made to Mr. J. W. Howell, 10, Apson Chambers, 68, Albion Street, Leeds, 1.

The Lighting Service Bureau has issued a publication dealing with electric-discharge lamps. The booklet, which has been designed to explain this new branch of lighting development to every type of likely consumer, describes the construction of the lamps and includes a number of excellent illustrations of works and street lighting installations in which this method of illumination has been employed.

Electric Vehicles in Greater London

A correspondent writes as follows:—"In the mutual interest of electric vehicle manufacturers and supply authorities it has been felt for some time that a uniform tariff operating over a wide area is an urgent necessity if the present popularity of the electric vehicle is to be systematically exploited. It is satisfactory to note, therefore, that the Electric Vehicle Committee of Greater London and South-East England set up by the British Electrical Development Association has formulated a recommendation which, if adopted, will result in uniformity of tariffs in the Greater London area. It is proposed that unrestricted supplies for electric vehicles shall be charged at the flat rate of ¾d. per kWh, with an alternative tariff of £2 10s. per kW of maximum demand per annum, plus a ½d. per kWh. Supply authorities are also urged to consider the adoption of a uniform tariff of 25s. per quarter for vehicles up to 10 cwt. and 35s. per quarter for those above 10 cwt. and up to 20 cwt., plus a running charge of ½d. per kWh, which will avoid the expense of maximum demand indicators. The great advantage of the latter tariff is its simplicity."

A view of work in progress during the recent laying of Crompton cable by the Metropolitan Electric Supply Co., at Elgin Avenue, Maida Vale

A Large Neon Sign

One of the latest neon displays to be completed by Claude-General Neon Lights, Ltd., occupies a site on Broad Quay, Bristol. Approximately 25 ft. high by 22 ft. wide, it has several interesting features. Most outstanding perhaps is the treatment of the word "Captan," which has resulted in a most successful "three-dimensional" effect. The letters of the word are graduated from 6 ft. to 8 ft. in height, the letters being of metal double trough section. A triple-outline of red "Claudgen" neon tubing is fitted in the main trough, with single-outline blue tubing in the "relief" portion of the trough, giving the effect of depth to the letters. By this method of illumination the word looks as if it were erected on a curve almost surrounding the design of the ship's capstan. "Wills's" is in 3 ft. 6 in. letters and "Cigarettes" in 3-ft. letters, all of inverted trough block metal letters with stepped edges and illuminated by double-outline 20-mm. red tubing fitted in the steps, thus producing a deep black centre to the letters. Superimposed over the letter signs is 238 ft. of 20-mm. blue tubing forming the design of a ship's capstan, and the complete sign is surrounded by an open trough metal border illuminated by single-outline 20mm. red tubing. The sign is arranged on a flasher so that the design of the capstan flashes on and off first, followed by the three words at half second intervals, the border, however, remaining steady all the time. The accompanying pictures show approximately the flashing sequence.

A large neon sign installed by Claude-General Neon Lights, Ltd., at Bristol

Electric-discharge Lighting in Industry

With reference to the note which appeared under this heading in our issue of August 6th the address of the steelworks of Smith Walker, Ltd., is Bashley Road, Acton, and not Bushey Road, as stated.

Prices of Materials

Henry Gardner & Co. report, August 18th: Copper bars (best selected), sheet and rod, £95, £2 dec. English pig lead, £24 10s., £1 dec. Spelter, £24 5s., £1 5s. dec. English block tin, £266 15s., £1 5s. dec.

Frederick Smith & Co. report, August 18th: Electrolytic copper bars, £64, £3 10s. dec. Ditto, ditto, wire rods, £69 10s., £3 dec. Ditto, ditto, h.c. wire, 9¼d., 1/8d. dec. Silicium bronze wire, 10¾d., ⅜d. dec.

Edward Till & Co. report, August 18th: No change in the price of India rubber, Para fine.

Fraser and Chalmers crushing, screening and conveying plant at Wraysbury

For Sale

Belfast Tramways Department invites offers for the purchase of generators and other plant.

Bath Electricity Department invites offers for the purchase of a generating set, motors and starters, and transformers.

(See our classified advertisements.)

Trade Announcements

The telephone number of the new London office of J. H. Tucker & Co., Ltd., is Museum 8081-2, and not as stated in our last week's issue.

Partridge, Wilson & Co., Ltd., have removed their London office to Sentinel House, Southampton Row, W.C.1 (telephone: Holborn 9200).

New Electricity Showrooms

Colchester Town Council is having plans prepared for the conversion of premises at West Mersea into electricity showrooms and offices.

Holidays with Pay

The Joint Industrial Council for the Electrical Cable-making Industry by resolution in May last decided that a week's holiday with pay should be granted to all employés in the industry. The scheme is in operation during the present holiday season.

Orders Recently Booked

C. A. Parsons & Co., Ltd., have secured an order for a 15,000-kW turbo-alternator and condenser for the City of Regina, capital of Saskatchewan, Canada. The value of the order is £50,000, and it will take about twelve months to execute.

French Domestic Electrical Trade

The appended table shows the French imports and exports of domestic electrical appliances during the first quarter of the current year, as compared with the corresponding three months of 1936. The French franc values have been converted to sterling at 125 to the £.

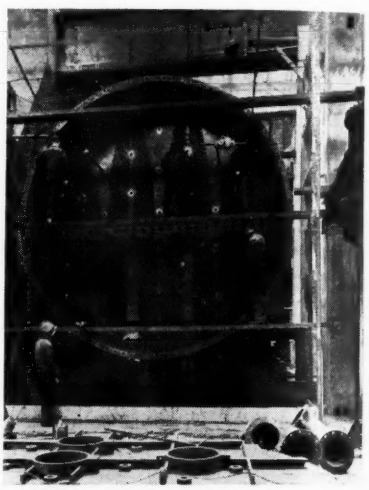
IMPORTS.	January–March. 1936. Fr.	1937. Fr.
Electric fires and stoves	1,158,000	1,086,060
Electric irons	13,000	128,000
Electric vacuum cleaners, boot cleaners, etc. ...	695,000	1,396,000
Electric refrigerators, etc.	2,344,000	3,104,000
Electric fans	58,000	146,000
Total fr.	4,268,000	5,860,000
Total at 125 fr. to £	£30,144	£46,880
Total exports all classes of domestic electrical appliances ... ... Fr.	2,023,000	2,636,000
	£16,184	£21,088

Gravel Works at Wraysbury

Equipment for handling gravel and sand recently put into operation at the pits of Thomas Roberts (Westminster), Ltd., at Wraysbury, Bucks, is capable of a daily production of 1,500 cu. yd. The crushing, screening and conveying plant, which is completely electrified, is capable of dealing with natural gravel at the rate of 120 tons per hr., and was supplied by Fraser and Chalmers Engineering Works, the mechanical plant having been manufactured at Erith, Kent, and the electrical equipment at the Witton Engineering Works of the G.E.C. The primary and secondary screens are driven by motors of 7½ h.p. and 12½ h.p. respectively, and the conveyors by one 3-h.p. and one 7½-h.p. motor. A "Sherwen" electromagnetic vibrating feeder delivers material to a cone crusher of the Symons short-head type, which was constructed by Fraser & Chalmers Engineering Works for the Nordberg Manufacturing Co. and is driven by a 150-h.p. motor mounted on an adjacent concrete platform. The grading screen and the conveyor feeding it are driven by motors of 7½ h.p. and 5 h.p., respectively. Conveyors and screens were manufactured at Erith in association with the Robins Conveying Belt Co., of New York. Electricity is taken at 415 V, three-phase, 50 cycles, from the a.c. mains of the Egham and Staines Electricity Co., Ltd., and G.E.C. totally enclosed, frame-cooled motors are used throughout. The Symons crusher is driven through vee-ropes by a slip-ring motor provided with an air-break rotor starting panel. The small motors for the conveyors and screens are of the high torque, squirrel-cage type, running at 900, 9[illegible], or 950 r.p.m., and driving through vee-ropes on to the screens, through chains to the two smaller conveyors, and through double reduction gears to the largest. They are fitted with push-button-operated contactor starters, all of the direct-to-line type, except in the case of the 12½-h.p. screen motor, which is controlled by a stator resistance starter, reducing the starting current taken.

A Large Condenser for Dalmarnock

In our issue of July 30th we referred to the extensions which are in progress at the Dalmarnock generating station of the Glasgow Corporation. The accompanying illustration is reproduced from a photograph sent to us by Mirrlees Watson Co., Ltd., and shows a 40,000-sq. ft. Mirrlees - Delas condenser in course of erection at the power station.



A Mirrlees-Delas condenser being erected at the Dalmarnock power station

Workers' Representatives on the J.E.A.

The Minister of Labour has given notice that as soon as may be after September 13th he will designate to the London and Home Counties Joint Electricity Authority, in accordance with Section 2 (10) of part 1 of the first annex to the schedule to the London and Home Counties Electricity District Order, 1925, the employés' organisations having members in the employment of authorised undertakings in the District, in order that the organisations so designated may choose two representatives of persons employed in connection with the supply of electricity in the District to be members of the Joint Authority. Any employés' organisation which is desirous of being considered by the Minister for designation under the said Section 2 (10) should make application in writing to the Minister not later than September 13th on the form provided for the purpose, of which copies may be obtained from the Secretary, Ministry of Labour, Montague House, Whitehall, London, S.W.1.

New Catalogues and Lists

British Insulated Cables, Ltd., Prescot, Lancs.—Publication M.31, describing, with illustrations, B.I. resistance welders.

British Thermostat Co., Ltd., Teddington Works, Windmill Road, Sunbury-on-Thames.—Catalogue section No. 309a, dealing with "Teddington" air and immersion thermostats.

Consolidated Pneumatic Tool Co., Ltd., Egyptian House, 170, Piccadilly, London, W.1.—An illustrated catalogue (No. 21), giving brief particulars of "Little Giant" portable electric tools for all purposes.

Switchgear & Cowans, Ltd., Elsinore Road, Old Trafford, Manchester, 16.—A pamphlet containing photographs and figures concerning some of the more interesting installations of S. & C. internal isolation switchgear installed in various parts of the country.

Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, London, W.1.—A 24-page art catalogue of electric fires illustrated and in colour.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—New pamphlets describing a.c. switchboard instruments, "Forscale-minor" ammeters and voltmeters, and metal-clad switchgear, cable couplers, cable racking, switch trucks, and electrode water heaters.

C. H. Andrews, Ltd., 3, Cross Lane, Eastcheap, London, E.C.3.—A leaflet illustrating linesmen's tools.

General Radiological & Surgical Apparatus Co., Ltd., 204-6, Great Portland Street, London, W.1.—A well-illustrated booklet of Siemens' focused grid diaphragms for X-ray examinations.

Mallinson & Eckersley, Ltd., Albert Saw Mills, Worsley Street, Salford, 3, Manchester.—An illustrated price-list of "Blackfriars Ware" woodcraft, including lighting fittings.

Rawlplug Co., Ltd., Cromwell Road, London, S.W.7.—A new edition of the booklet on "Fixing Devices."

Revo Electric Co., Ltd., Tipton, Staffs.—A 56-page art catalogue of sodium and mercury electric-discharge lighting equipment.

Private Arrangements

A. J. Hayes, electrical engineer, 30, Marlow Avenue, Eastbourne.—The creditors met recently at the office of the Eastbourne and District Chamber of Commerce, when Mr. A. E. Orbell, accountant and auditor, 6-7, Old Steine, Brighton, submitted a statement of affairs which showed ranking liabilities of £324, of which £285 was due to the trade and £39 to a cash creditor. In addition, there were fully secured cash creditors for £655. After allowing £5 for preferential claims the net assets were £55, leaving a deficiency of £269. The creditors unanimously decided that the debtor should give Mr. Orbell authority to realise the assets and distribute the proceeds *pro rata* among the creditors, and out of his future earnings the debtor was to undertake to make up the dividend payable to the creditors to 5s. in the £.

William Grimes & Sons, Ltd., King Street, Wigan, wireless dealers, &c.—At the meeting of the creditors an approximate statement of affairs was submitted which showed liabilities of £1,153, of which £1,065 was due to the trade and £88 to the bank. There was also a fully secured creditor for £15. After allowing £72 for preferential claims the net assets were £760, leaving a deficiency, as regarded the creditors, of £393. The issued capital was £1,125, and so far as the shareholders were concerned there was a deficiency of £1,519. The company was formed in 1911 with a nominal capital of £1,500. During recent years losses had been sustained on the trading. In 1935 the net loss was £59, and in the two subsequent years it was £93 and £234, respectively. It was further stated that financial assistance had been acquired and a cash offer of 10s. in the £ could be submitted. After a short discussion it was decided that the offer should be accepted.

E. H. Marsden, wireless and car radio specialist, late Sussex Road, Southport.—The creditors herein met recently at Southport, when it was reported that the liabilities totalled £165, all due to the trade. The assets totalled £36, leaving a deficiency of £129. It was stated that when the debtor commenced trading he had a capital of £40 and also obtained assistance from his father to the extent of £50. The drawings had been between £2 5s. and £2 10s. a week. The debtor had no offer to submit, but it was stated that his father had agreed to waive his claim of £50. The accountant stated that he had received an offer for the stock, but before accepting he was communicating with the principal creditors with a view to ascertaining their wishes in regard to the matter.

Bankruptcy Proceedings

H. Jeffree, 72 and 76, High Street, Thornton Heath, Surrey, radio dealer.—The first meeting of creditors was held on August 4th at 29, Russell Square, London, W.C., when the statement of affairs disclosed gross liabilities of £1,917, of which £1,622 was expected to rank for dividend, with a similar deficiency. The debtor attributed his failure to heavy law costs and bad debts. The case being a summary one was left in the hands of the Official Receiver, as trustee.

J. N. Waring, electrical engineer, 22, Grangecliffe Gardens, Sydenham, S.E.25, lately carrying on business at 9, Sandland Street, Bedford Row, W.C.1.—Receiving order made August 5th on a creditor's petition. Public examination November 2nd at Bankruptcy Buildings, Carey Street, W.C.2.

L. A. W. Steinmetz, electrical dealer, 52, Bromham Road, Bedford.—Receiving order made August 6th on a creditor's petition.

F. H. Pountney (Bordesley Electrical Co.), electrical engineer, 164, High Street, Bordesley, Birmingham.—Last day for receiving proofs for dividend August 24th. Trustee, Mr. F. E. Bendall, 3, Warwick Passage, Corporation Street, Birmingham.

P. D. Watkins, radio engineer, 48, High Street, Criccieth.—First and final dividend of 5d. in the £, payable August 27th at the Official Receiver's office, St. Peter's Churchyard, The Cross, Chester.

D. P. Phillips, radio dealer, Cartref, Talog, Carmarthen.—First meeting August 20th at 4, Queen Street, Carmarthen. Public examination October 12th at the Guildhall, Carmarthen.

P. A. Manley, radio dealer, 136, Ashton New Road, Manchester.—Trustee, Mr. F. H. Langmaid, Byrom Street, Manchester, Senior Official Receiver, released August 4th.

C. Thornton, wireless dealer, Radio Store, Main Street, Ffynnongroew.—First and final dividend of 3s. 2d. in the £, payable August 27th at the Official Receiver's office, St. Peter's Churchyard, The Cross, Chester.

N. Millard, wireless, cycle and electrical engineer, 1, Mercatoria Street, St. Leonards-on-Sea.—Last day for receiving proofs for dividend September 1st. Trustee, Mr. V. R. Fletcher, 8, Old Steine, Brighton, Official Receiver.

Company Liquidations

Northampton Radio & Plating Co., Ltd., 71, St. Giles Street, Northampton.—At the statutory meeting of the creditors the statement of affairs showed ranking liabilities of £1,008, due to unsecured creditors. After allowing £13 for preferential claims the net assets were £443, leaving a deficiency, as regarded the creditors, of £560. The issued capital was £602, and so far as the shareholders were concerned there was a deficiency of £1,162. The position was attributed chiefly to inability to obtain supplies owing to alleged cutting of prices by the business taken over. The company, as a matter of fact, had never cut prices. Resolutions were passed confirming the voluntary liquidation of the company with Mr. A. W. H. Lenton, C.A., Northampton, as liquidator, with a committee.

Flactophone Wireless, Ltd.—Meeting September 15th at 26 and 27, Park Row, Leeds, to receive an account of the winding-up by the liquidator, Mr. A. R. Metcalf.

Radio & Electrical Supplies (Western), Ltd.—Particulars of claims by September 21st to the liquidator, Mr. G. M. Davies, 28, Rutland Street, Swansea.

Llangefni Electric Light & Power Co., Ltd.—Winding up voluntarily. Liquidator, Mr. W. Owen, Glyn Derw, Llangefni.

Wiring, Ltd.—Particulars of claims by August 31st to the liquidator, Mr. A. E. Attwood, Balfour House, Finsbury Pavement, E.C.2.

Swedish Electrical Imports and Exports

THERE were some noteworthy increases in the value of Sweden's electrical imports last year, *e.g.*, power plant and cables. At the same time, exports in all the important categories except stators, rotors, &c., also advanced. In the electrical trade as a whole the balance is in Sweden's favour.

The following table giving details of imports and exports in the principal groups, with chief countries of origin or destination, is based on the official returns. It will be seen that Sweden's field of export is very wide. In addition to countries mentioned below, South Africa, Australia, New Zealand and India have been fair customers for machinery, and Norway and Czechoslovakia for accumulators. Destinations of vacuum cleaners are not available later than 1935; then the leading markets were Australia, Switzerland, New Zealand, Belgium, Czechoslovakia, Austria, Holland and Brazil. The exchange value of the krone is approximately 1s.

IMPORTS

	1936 Kr. (000)	Inc. or or Dec. on 1935. Kr. (000).
Batteries, accumulators and parts—		
Total	2,000	− 76
From United Kingdom	380	− 70
„ Germany	662	− 38
Radio apparatus—		
Total	13,760	+ 288
From United Kingdom	1,756	− 949
„ Germany	4,320	+ 855
„ Holland	3,994	− 655
„ United States	2,287	+ 747
Motors, generators, convertors, and transformers—		
Total	7,528	+ 1,848
From United Kingdom	457	+ 240
„ Germany	4,937	+ 930
„ United States	637	+ 27
Stators, rotors, current collectors, etc.—		
Total	709	− 14
From United Kingdom	39	+ 9
„ Germany	490	− 40
Metal filament lamps—		
Total	1,581	+ 71
From Germany	746	− 54
„ Holland	401	+ 41
Carbon for electrical purposes—		
Total	2,635	− 55
From United Kingdom	315	− 110
„ Germany	1,238	+ 330
Regulating and control apparatus—		
Total	500	+ 106
From United Kingdom	23	− 12
„ Germany	306	+ 63
Switches, etc.—		
Total	3,971	+ 401
From Germany	3,520	+ 1,057
„ United Kingdom	46	+ 2
Electricity meters—		
Total	1,391	+ 272
From United Kingdom	—	− 96
„ Germany	1,292	+ 439
Other electrical measuring instruments—		
Total	953	+ 150
From United Kingdom	81	− 80
„ Germany	705	+ 200
Insulated cables and wires—		
Total	4,632	+ 558
From Germany	3,877	+ 1,897
„ United Kingdom	60	+ 20
X-ray apparatus—		
Total	371	− 65
From Germany	328	− 83
Vacuum cleaners—		
Total	1,019	+ 361
From Germany	263	− 343

EXPORTS

	1936 Kr. (000)	Inc. or or Dec. on 1935. Kr. (000).
Motors, generators, transformers and convertors—		
Total	12,716	+ 568
To United Kingdom	935	− 881
„ Soviet Russia	45	+ 43
„ China	280	+ 4
„ Iran	15	− 251
„ Irish Free State	340	+ 314
„ Japan	120	+ 65
„ Argentina	586	+ 148
„ Brazil	553	− 337
„ Mexico	391	+ 92
„ Canada	351	− 159
„ Norway	824	+ 154
„ Finland	1,512	+ 17
Vacuum cleaners—		
Total	4,358	− 2,342
Accumulators, batteries and parts—		
Total	1,410	− 30
Stators, rotors, current collectors, etc.—		
Total	3,494	− 1,386
To United Kingdom	741	− 121
„ France	695	+ 295
Switches, etc.—		
Total	681	− 175
To United Kingdom	185	+ 120
„ Finland	127	+ 47
Telegraph and telephone apparatus—		
Total	6,560	+ 1,560
To Italy	7	− 342
„ British South Africa	426	+ 84
„ Poland	1,535	+ 515
„ India	16	− 2
„ China	169	− 189
„ Finland	806	+ 458
„ Norway	263	+ 106
Insulated wires and cables—		
Total	2,663	+ 413
To United Kingdom	80	+ 10
„ Mexico	165	− 42
„ China	30	+ 23
„ Poland	90	+ 47
„ Finland	436	+ 151
„ Turkey	390	+ 340
Metal filament lamps—		
Total	1,143	+ 8
To Denmark	96	− 40
„ Norway	100	− 33
„ Irish Free State	28	− 153
„ Turkey	117	− 35
„ Argentina	156	+ 4
Carbons for electrical purposes—		
Total	429	+ 116
To United Kingdom	10	− 15
„ Norway	165	+ 45
Radio apparatus—		
Total	1,096	+ 6
To Finland	707	+ 200
„ Brazil	3	—
„ Argentina	11	− 4
Norway	101	− 5

Electricity Supply

Lighting, Domestic, Power

Ashby Woulds (Swadlincote).—NEW CABLE.—An application by the Leicestershire and Warwickshire Electric Power Co. to lay a cable at Newfield, Moira, has been granted by the Urban District Council.

Ashford.—METER TESTING.—Application is to be made to the Electricity Commissioners by the Urban District Council for sanction to borrow £1,000 for the provision of a meter-testing station.

Beckenham.—ELECTRICAL INSTALLATION SCHEME.—The Town Council has agreed to a scheme for installing electric lighting in the Council houses at West Wickham, to apply in the first instance to twenty-one houses.

Blackpool.—ILLUMINATIONS.—Work is in hand on an extensive scheme of illuminations to be in operation from September 18th until October 25th.

NEW EQUIPMENT.—The Electricity Committee has allocated the following amounts out of the profits of the Department: £4,000 for new transformer houses, switchgear and transformers; £5,000 for replacing old switchgear and transformers; £6,000 for new meters; £12,173 for rate aid; and £19,247 for reserve fund. Tenders are to be invited for the erection and equipment of a new switchroom at the electricity works.

Bury St. Edmunds.—MORE PROPAGANDA NEEDED.—So far as future progress is concerned, the borough electrical engineer (Mr. A. E. Knights) believes that with the existing tariffs (average price obtained last year, 1.96d.) the undertaking should continue to expand, but he stresses that more attention must be paid to the sales and propaganda side if really good results are to be achieved. During the past year the undertaking sold 3.5 million kWh, an increase of 13 per cent.

Cardiff.—SUB-STATION.—The Electricity Committee is to provide a sub-station in Severn Road at a cost of £2,535.

Cheshire.—PROPOSED 132-KV LINE.—At a recent meeting of the Roads Committee of the County Council reference was made to the proposals of the Central Electricity Board for the acquisition of wayleaves for a 132-kV line from Percival Lane, Runcorn, to a grid transforming station to be constructed near Upton, Birkenhead. It was stated that the local authorities concerned had decided that their surveyors should consider the matter with a view to indicating a more convenient route, having regard to the amenities of the districts.

The windmill at Headcorn (Kent) illuminated by "Osira" floodlight projectors. Mr. R. G. P. Wyatt, electrical contractor, Bethersden, was responsible for the installation.

China.—ELECTRICAL OUTPUT.—The output of electricity in 1936 was 1,740 million kWh, an increase of 11 per cent. over the preceding year, states the *Chinese Economic Journal*. There were then 456 power stations with a combined capacity of 585,424 kW, and this total is now being augmented by 120,000 kW. Ten are foreign owned and represent 47 per cent. of the total plant capacity of the country, 58 per cent. of the annual power production and 62 per cent. of the aggregate sum invested in the supply industry. Of the remaining forty-six power concerns, twenty-three are owned by the Government, five by joint Government and private enterprises, four by joint Sino-foreign interests, and 414 by purely private interests. The annual output of electricity has more than doubled during the past decade. The most rapid development has been in the province of Kiangsu, where production amounted to nearly 252 million kWh, or one-sixth of the total for the whole country, the province next in importance from an electrical point of view being Kuangtung, with 109.5 million kWh. Most of the large plants in Kiangsu are situated in Shanghai and Nanking.

Clitheroe.—SHOP LIGHTING TARIFF.—The Electricity Committee has adopted a two-part tariff for shop lighting, the annual charge being £10 per kW of lighting installed, plus 1d. per kWh.

Clydebank.—ELECTRIC LIGHTING PROPOSAL.—The Town Council has adopted a recommendation that an estimate be obtained for the conversion of street lighting from gas to electricity, with provision for mercury electric-discharge lamps along the main streets.

Darlington.—MAINS.—The Town Council is to lay high-voltage cables underground from the Harrowgate Hill sub-station to Beaumont Hill, West Auckland Road to Marwood Crescent, Bates Avenue sub-station to Nickstream Lane, Abbey Road to Parvins estate, Coniscliffe Road to Southend Avenue, Southend Avenue to Polam Hill, Henderson Street to Polam Hill, Cleveland Bridge sub-station to Geneva Road East, and Hurworth sub-station to Croft sub-station.

Dutch East Indies.—HYDRO-ELECTRIC POWER STATION.—The Nederlandsche-Indische Electriciteit Maatschappij announces that a new agreement has been arrived at with the Dutch East Indies Government regarding the construction of a large hydro-electric power station in Central Java and the grouping of the various existing concessions into two—one for Eastern and one for Central Java.

Goathland.—SUPPLY PROJECT.—It is understood that, despite the extra cost, underground cables will be used for the supply of electricity to the village.

Gosforth (Northumberland).—SUB-STATION.—The North-Eastern Electric Supply Co., Ltd., is to erect a sub-station in Jubilee Road.

Heckmondwike.—STREET LIGHTING.—A scheme is to be prepared for street lighting in High Street, Jeremy Lane, Bridge Street and New North Road by means of mercury electric-discharge lamps.

Huddersfield.—REDUCED CHARGES.—Lower charges for electricity have been announced by Mr. J. W. Turner, the borough electrical engineer. For domestic consumers under the two-part tariff the rate of ½d. per kWh is to apply only for the first 240 kWh (instead of 360 kWh) per quarter, consumption thereafter being charged at ½d. For lighting (non-domestic) only 40 kWh per kVA per half-year (instead of 50 kWh) will be charged at 4d., and for industrial heating and cooking the first 40 kWh (instead of 100 kWh) per kVA of maximum demand per half-year will be charged at 1d. The sliding scale for power is also reduced.

Kettering.—SUB-STATION.—The Electricity Department proposes to erect a sub-station on the Cottingham Road estate, Corby.

Lancashire.—ELECTRICAL INSTALLATION.—The County Health Committee is seeking sanction to borrow £1,303 for an electrical installation at the Whiston Institution.

Lancaster.—EXTENSIONS.—Application is being made by the Electricity Committee for permission to borrow £10,000 for extensions to plant and mains as follows: Spring Garden Street sub-station, £3,000; Skerton sub-station, £700; mains, £6,300.

SUPPLY TO MILLS.—Terms have been offered Storey Bros. & Co., Ltd., for a supply of electricity to Caton Mills, and a supply is to be provided to Corless Mills, Dolphinholme.

Margate.—STREET LIGHTING.—The Town Council has accepted the tender of the Isle of Thanet Electric Supply Co., Ltd., for lighting the Royal Esplanade and Gordon Road, Westwood, by electricity.

Growth of the Liverpool Undertaking

BESIDES the normal expansion of the undertaking the Liverpool Electric Supply Department last year handled the supply to Prescot, which on April 1st, 1936, was taken over from British Insulated Cables, Ltd. Mr. P. J. Robinson, the city electrical engineer, regards it as very satisfactory that, in the first year of operation, sales amounted to nearly 28 million kWh as compared with the 14.6 million kWh which the Department supplied to the company in the previous year. In connection with the electrification of the L.M.S. Wirral Railway, the Minister of Transport sanctioned the proposal of the Railway Company to obtain a supply from the Department, this being upheld in the Chancery Division in April last. At the end of the year the load-carrying capacity of the plant at the power stations was as follows: Clarence Dock, 102,500 kW; Lister Drive Nos. 1 and 2, 35,000 kW; and Lister Drive No. 3, 50,000 kW, a total of 187,000 kW. Extensions in hand at Clarence Dock included two 50,000-kW sets. Energy generated by the combined stations (including export) totalled 609.2 million kWh in 1935-6 and 835.4 million kWh last year, an increase of 37 per cent., the maximum load rising by a little under 18 per cent. to 177,130 kW. Although the combined thermal efficiency improved from 23.6 to 24.3 per cent., there was an increase from 0.146d. to 0.155d. in the works' cost per kWh sent out, due to the rise in the cost of coal. In its area of supply, which now exceeds 142 square miles, the Department sold 435.3 million kWh, an increase of 12 per cent., the average price obtained falling from 1.067d. to 1.024d. Consumers increased in number by 20,789 to 156,536. considerable progress was made during the year in the use of electrical apparatus for domestic purposes, there being, at the end of the period, over 21,500 cookers, 3,000 wash-boilers, 1,820 radiators and 3,700 immersion heaters maintained by the Department. In regard to rural development, approximately 20 miles of overhead lines were erected. The gross profit on the year's working was £744,407 (against £707,229) and the net profit £99,379 (£99,395), out of which £70,000 is being contributed to the rates.

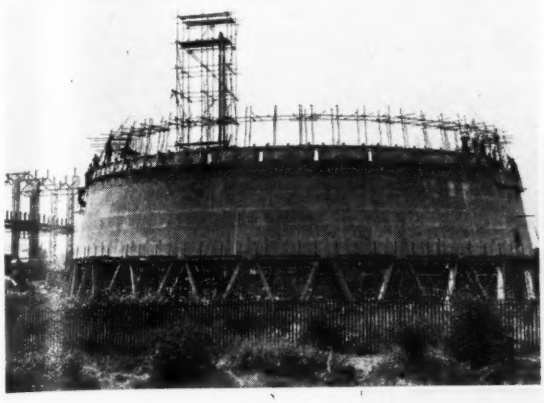
Market Drayton.—STREET LIGHTING.—The Urban District Council has accepted the tender of the Market Drayton Electric Light Co. for street lighting by electricity.

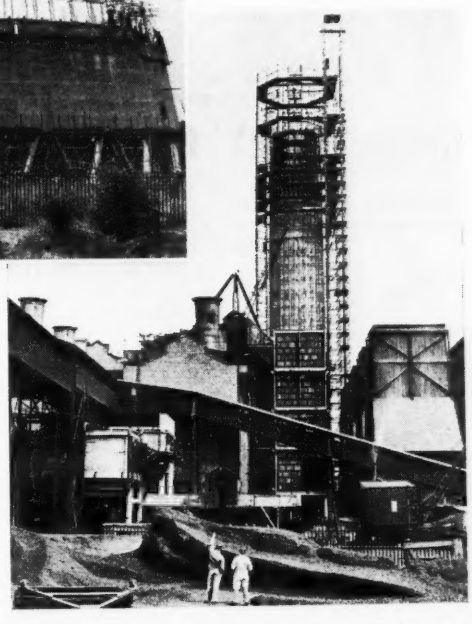
Marlborough.—REDUCED TWO-PART TARIFF.—The Town Council has adopted a recommendation by the Electricity Committee that the "unit" charge under the two-part tariff shall be reduced from 1d. to ¾d. as from October 1st next.

Moffat.—ILLUMINATIONS.—A scheme for floodlighting and decorative lighting at the public park has been submitted to the Town Council by the Dumfries county electrical engineer. The installation would cost £196.

Newcastle-on-Tyne.—SUB-STATION.—Plans have been approved for the erection of a sub-station in Welbeck Road for the Transport and Electricity Committee.

Portland.—SCHOOL HEATING.—For the heating of St. John's School, the following tariff has been decided upon by the Electricity Committee:—Up to 30,000 kWh a year at ½d. per kWh, and all in excess at ¾d. per kWh, subject to a coal clause and five-year contract.





[*Elec. Rev.* photo.

The Willesden power station of the London Power Co. is being modernised. Two 90,000 lb. boilers have already been completed, while a 1.5 million gal. concrete water-cooling tower is being built by the Davenport Engineering Co. The new 235-ft. concrete chimney is to deal with the whole of the gases from the power station, replacing the older short chimneys. Gas-washing facilities are also being provided.

Ramsey.—SUPPLY DEADLOCK.—The Urban District Council is adhering to decision to refuse permission for the Beds and Cambs and Hunts Electricity Co. to extend the supply in Hollow Lane by means of overhead lines. The company does not consider that it is justified in going to the expense of using underground cables.

Rugby.—MAINS EXTENSIONS.—Mains are to be extended to the Westfield estate, Bilton Road, Rugby.

Rumania.—NEW GENERATING PLANT.—The Rumanian Government is at present working out details of a plan, accepted in principle, which will involve the construction of ten new generating stations. These are intended largely to help in the development of small rural enterprises. The plan provides for subsidies from the Government, not only for the construction of the generating stations, but also for the erection of the distribution network.

Southend-on-Sea.—ILLUMINATIONS.—A number of new features have been included in the extensive illuminations at Southend, which this year will be in operation from August 25th until the night of October 17th. One of these is the "Tropical Garden Solarium." "Never-Never Land," in the Shrubbery, has been redesigned.

Stoke-on-Trent.—SUB-STATION.—The Electricity Committee is to provide a sub-station and extend mains at Trentham Road, Blurton, at a cost of £2,688.

CHANGE-OVER.—The Electricity Committee proposes to make arrangements for a change-over at the works of Doulton & Co., Ltd., Nile Street, Burslem, at a cost of £1,850.

SUPPLY EXTENSIONS.—At a cost of £240 the Electricity Committee is to provide a supply to 35 houses in Hempstalls Lane, Wolstanton. An arrangement is to be made with J. G. Holloway & Co. with regard to the supply of electricity by the Corporation to 174 houses proposed to be erected on the Weston Coyney housing site at a cost of £1,150. Mains are also to be extended at a cost of £900 to supply 45 houses to be erected at Penkhull. Low-voltage cables and feeder pillars are to be provided to enable a general supply to be afforded in the Harpfield by-pass road at a cost of £3,800.

Straits Settlements.—SINGAPORE.—Mr. S. S. Wilson, municipal electrical engineer, reports an increase of 11 per cent. to 37.9 million kWh in sales of energy during 1936, consumers increasing by 1,619 to 22,115. Working costs were less, largely due to a marked decrease in coal consumption per kWh generated (from 2.30 to 1.76 lb.), and for the first time a contribution was made to the Rate Fund. The erection of a new 10,000-kW turbo-alternator (Met.-Vick.) was commenced during the latter part of the year.

Sweden.—BOMB-PROOF POWER STATION.—Work is proceeding on the erection of a large power station at Stadsforsen, on the River Indalsalven. A feature of the station will be complete protection against attack from the air, at least by any type of bombing aeroplane at present known. The station will cost over 20 million kronor (£1,100,000 at par), and the work, which was begun in 1936, is expected to be completed in 1940.

PRODUCTION OF ELECTRICITY.—The report of the Board of Waterfalls, which administers the State water-power plants, shows that for 1936 there was an unusually good supply of water to the plants operated by the Board throughout the country. The plants have been run at a profit totalling 19 million kronor (£1,045,000 at par), which is a little over 500,000 kronor more than for 1935. The increase in energy production compared with 1935 was 7 per cent.

LONG-DISTANCE POWER TRANSMISSION.—A meeting of leading Swedish electrical engineers was recently held in Stockholm to discuss problems connected with the electrical industry in that country, chief among which is the question of transmitting to Southern Sweden the energy produced by the rich hydro-electric power reserves of the far north. Already a power transmission line nearly 625 miles long is under construction between the new hydro-electric station at Krängede in Northern Sweden and Malmö in the extreme south. Mr. E. Volander, the secretary of the Swedish Association for the National Utilisation of Electricity, who organised the meeting, forecasts that it will not be long before the big Lapland rivers will furnish power to Southern Sweden, 930 miles away.

Swindon.—WORKS CHANGE-OVER.—It has been decided to change over the plant at the Great Western Railway Co.'s engine and carriage works to a.c., and a start has been made in the "A" machine shop and the No. 15 fitting shop. At present the a.c. supply from the Corporation is converted to d.c. at the works.

Tynemouth. — SUB STATION. — The North-Eastern Electric Supply Co., Ltd., proposes to erect a sub-station in Murton Lane.

Wakefield.—LOAN.—The Electricity Committee is seeking sanction to borrow £10,000 for electrical apparatus and £5,000 for metering equipment.

Watford.—NEW TARIFFS.—The Corporation announces that the tariffs for electricity will be adjusted as follows as from the accounts for the September quarter: Lighting flat rate, first 30 kWh in the winter and first 13 kWh in the summer, 5d. per kWh; secondary charge to remain at 2½d. per kWh. Heating: Summer rate to be 15 kWh per quarter at 2d. per kWh and all in excess at ½d.; winter rate, 15 kWh per quarter at 2d. per kWh; next 500 kWh at 1d.; next 500 kWh at ¾d.; all in excess at ½d Lighting and heating meter rentals to be abolished. Power: Present running charge to remain, but concessions in regard to rental of meters. Accounts to be subject to a rebate of 10 per cent. instead of 5 per cent. The present cash discount of 5 per cent. remains in force. Consumers purchasing electricity through prepayment meters will be allowed a rebate of ¼d. per kWh as from the date of the next collection subsequent to July 27th, 1937.

West Hartlepool.—EXTENSIONS.—In connection with extensions to the distribution system the Town Council is to apply for sanction to borrow £7,700.

SUB-STATION.—The Town Council proposes erecting a sub-station in Ouston Street.

Weymouth.—SUB-STATION.—The Electricity Committee is to erect a sub-station at Wyke Regis at a cost of £389.

Communications

BURMA.—TELEPHONE DEVELOPMENTS.—A large scheme of rural telephone systems, designed to enable Burmese farmers, mill-owners and local industrialists to get into direct touch with markets, is foreshadowed in an official communique issued in Rangoon, states *Reuter*. The small Burmese towns and villages will be linked together by telephone; in addition, trunk tele-

phone facilities will be made available at low charges. The Posts and Telegraphs Department has already obtained the sanction of the Government of Burma for the establishment of this rural-urban telephone link. The apparatus to be used in rural telephone systems will be of the magneto type.

Germany.—TELEVISION.—According to the *Wireless World*, the 729-line pictures which were successfully demonstrated by the Fernseh A.-G. prior to the Radio Show were discontinued. A reason was not given, but it was understood to be non-technical; it therefore seems possible that the high standard was thought likely to distract from the importance of the normal standard adopted. The pictures showed a slight flicker owing to the brilliance of the illumination of the screen, but they were otherwise good, giving great shadow detail.

Great Britain.—RADIO LICENCES.—It is stated that 323,489 radio licences were issued by the Post Office during July, representing a net increase of 34,982. The total in force at the end of the month was 8,269,500, as compared with 7,718,794 on July 31st, 1936.

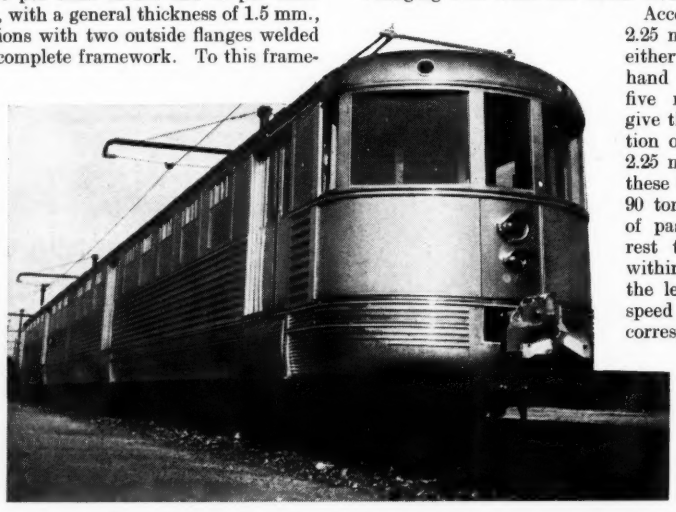
India.—BROADCASTING.—A *Reuter* message from Bombay states that four new short-wave and five new medium-wave stations are to be built in India. A statement issued by the Government-owned All-India Radio on the impending expansion of its services points out that while the area of India is roughly thirty times that of the British Isles the Government's development grant of £300,000 is less than the amount required for supplying a television service in London. It has been decided to establish four 10-kW short-wave "key" stations at Delhi, Bombay, Calcutta and Madras to provide what is termed a "second grade" service to the whole of India. A second short-wave transmitter of 5 kW is also to be provided at Delhi for special purposes. At the same time, five medium-wave stations will be erected at Lahore, Lucknow, Trichinopoly, Decca and Madras. With the exception of the Madras transmitter, which will have a power of 250 W, all these stations will have a power of 5 kW. Their function will be to provide a first-grade service to the large towns and surrounding districts in which they are situated. With these stations, and the medium-wave stations already in operation at Delhi, Bombay, Calcutta and Peshawar, All-India Radio will eventually have in operation five short-wave stations and nine medium-wave stations throughout the country. Two of the new stations, the short-wave station at Delhi and the medium-wave one at Lahore, are expected to be in operation by the end of this year.

United States.—POWERFUL NEW TRANSMITTER.—The American General Electric Company's stations W2XAD and W2XAF will become the most powerful short wave in America and probably in the world on completion early next year of a new 100-kW transmitter, permission for the erection of which has just been granted by the Federal Communications Commission, learns *Reuter's Trade Service* from New York. The new equipment will cost over 100,000 dollars and increase the signal to more than twice its present strength, affording much stronger and clearer reception all over the world. The transmitter will be a linear radio-frequency amplifier and usable by either of the two short-wave stations, and the greater signal strength should allow the world-wide reception throughout the year.

Stainless Steel Electric Trains

SEVERAL of the 20 two-car electric trains designed for a variety of services on the newly electrified Paris-Le Mans main line are now in use. Although embodying no unique features, both the mechanical and electrical portions incorporate a number of up-to-date details and methods of construction.

For example, the bodies of the twin cars are fabricated of stainless steel containing 8 per cent. nickel and 18 per cent. chromium. This material, with a general thickness of 1.5 mm., is formed into square sections with two outside flanges welded together and used for the complete framework. To this framework are welded the side, roof, and floor plates. The complete structure is welded up electrically by the Budd automatically applied Shotweld process, and in the twin cars, with a combined length of 128 ft., there are almost 600,000 of these point welds. The Budd system makes use at low voltage of high amperage passed through plates held between copper electrodes and confines the heat almost entirely to the metal between the electrodes.



A 1,330 h.p. two-car electric train operated by the French State Railways

The two cars of the train are articulated and carried on three bogies, each of which is driven by two nose-suspended electric motors wound for the full line voltage of 1,500; normally, the two motors on each bogie work coupled in series, but the whole set can be operated six in series if desired. On the continuous rating each motor has an output of 147 kW, or 240 A at 675 V (corresponding to 1,350 V in the contact wire), at a speed of 1,320 r.p.m., or a track speed of 51 m.p.h. On the one-hour rating the power per motor is 166 kW, or 275 A at 675 V and at a speed of 1,220 r.p.m., or 46.5 m.p.h. These ratings are with a temperature rise of 115 deg. C., but if the more normal value of 120 deg. C. is allowed there is an increment in power of 2 to 5 per cent.

These motors, built by the French Westinghouse concern (Soc. Le Matériel Electrique S-W), weigh 3,370 lb., equivalent to 14.3 lb. per h.p. on the maximum one-hour rating. Roller bearings are provided for the armature and bronze white-metalled axle bearings. The motors can be operated in all groupings at one full field and one shunted field position, the number of windings per main pole being 40 at full field (23 on the armature side and 17 on the frame side) and 23 with weak field. With weak field they have been tested up to an output of 450 kW, with 900 V at the brushes. The 37½-in. wheels of the bogies are driven through single-spur gears with a ratio of 54 :19. Multiple-unit control of the Jeumont camshaft type with 42 notches allows the six motors to be grouped all in series, in two parallel groups of three in series, or in three parallel groups of two in series; but should a defect occur in any one motor it would be necessary to cut it and two of its fellows out. The use of 42 notches results in a maximum drop of only 14 per cent. in the tractive effort when changing over from one notch to another.

Acceleration of the order of 2.25 m.p.h. p.s. can be attained either automatically or with hand regulation, and the first five notches of the controller give theoretical rates of acceleration of 0.68, 1.12, 1.56, 1.9, and 2.25 m.p.h. p.s. On test one of these 65-ton trains, loaded up to 90 tons to represent a full load of passengers, accelerated from rest to 80 m.p.h. in 213 sec. within a distance of 12,150 ft. on the level. The maximum safe speed of these trains is 93 m.p.h., corresponding to a motor speed of 2,440 r.p.m.

Equipment for the main power circuit is principally in two separate compartments, one of which contains four resistance contactors, eight shunting contactors, and 14 non-ventilated resistance contactors, and the other a quadruple reverser, three line breakers, two resistance contactors, and 20 coupling contactors. There is also a convertor set for the operation of the train at low speeds in depôts, using a 360-V supply. The control system is operated from the 1,500-V overhead line supply, as are also the motor-compressor sets for the brake, pneumatically operated doors and control, and for the air-conditioning plant, but the remaining auxiliaries are fed by a 72-V circuit which is separately supplied by means of a motor-generator set.

There is passenger accommodation for 132 sitting and 190 standing in the two cars, which extend over a length of 133 ft. Some complication arose in the design of the motors and control gear because of the great variety of services which were envisaged for the trains, ranging from a 13-min. schedule from Paris to Sèvres, six miles, including three intermediate stops, to a 54-min. schedule from Paris to Rambouillet, 29.8 miles, including nine intermediate stops; and a non-stop timing of 120 min. for the 131 miles from Paris to Le Mans. Actually, the trains have made the first run in 10 min., the second in 41 min., and the third in 110 min. non-stop, and in 134 min. with nine intermediate stops. All these last trips were made without the speed exceeding the normal service maximum of 80 m.p.h.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aldershot.—August 31st. Borough Council. Electric wiring at seventy-eight houses at Aldershot Park. (August 6th.) Transformers and one transforming kiosk with switchgear. (August 13th.)

Australia.—MELBOURNE.—August 31st. Posts and Telegraphs Department. Telephone accessories. (T. 18024/37.)*
September 6th. City Council. Electrically driven centrifugal pump and spares. (T.Y. 25943/37.)*
MILDURA (VICTORIA).—September 15th. Electricity Supply Department. Switchgear. (T.Y. 25942/37.)*

Barrow-in-Furness.—August 23rd. Gas and Water Department. Two sets of electrically driven centrifugal pumps for an output of 2,750 gal. per min. against a head of 140 ft., together with transformers, rectifiers, switchgear, pipes, valves, &c. Engineer and manager, Gas and Water Department, Salthouse Gasworks (deposit £2 2s.).

Birmingham.—September 10th. Electric Supply Department. Domestic electrical apparatus for one year. (August 13th.)
September 15th. All-insulated switch-fuses for one year. (See this issue.)

Blackpool.—September 21st. Borough Council. Two sets of three oil-immersed, single-phase reactors. (See this issue.)

Brighton.—August 23rd. Borough Council. Electrical fittings for the Municipal Hospital and the Warren Farm schools. Steward's Office, Municipal Hospital, Elm Grove.

Cannock.—August 24th. U.D.C. Electric lighting installations in connection with 196 houses on sites at Cannock, Chadsmood and Hednesford. W. C. Speedy, clerk of the Council, Council House.

Cardiff.—September 13th. R.D.C. Electricity Department. Four 25-kVA and six 10-kVA transformers, and construction of e.h.v. and l.v. overhead lines. (August 13th.)

Cheddleton.—September 6th. Mental Hospital Committee. Six months' supply of electric lamps. G. Lawton, clerk, Cheddleton Mental Hospital, near Leek, Staffs.

Chelmsford.—August 23rd. Education Committee. Electric lighting and power installation at the Moulsham senior, junior and infants' schools, Princess Road. H. W. Allardyce, architect, Clock House Chambers, Barking (deposit £5).

Chesterfield.—August 27th. Electricity Department. Six miles of e.h.v. and l.v. cables and two outdoor-type transformer kiosks. (August 13th.)

Cleethorpes.—September 11th. Borough Council. H.v. switchgear. (August 13th.)

Denmark.—COPENHAGEN.—August 27th. Lighting Department. Electrically driven boiler and pumping set. (T.Y. 18046/37.)*

East Grinstead.—August 25th. U.D.C. P.i., l.c. and armoured cables for the period ending August 31st, 1938. (August 6th.)

Edinburgh.—September 6th. Corporation. Electrical, heating and ventilating works at the Public Library, Dundee Street. City architect.

Essex.—September 6th. County Council Education Committee. Electrical installation at the South West Technical College, Walthamstow. (August 13th.)

Heston and Isleworth.—September 7th. Borough Council. Fire protection equipment at the Electricity Works, Bridge Road, Hounslow. (August 13th.)

Ilford.—August 27th. Electricity Department. One 500-kW rectifier equipment, comprising two 250-kW units for traction supply. (August 6th.)

India.—September 8th. Bombay, Baroda and Central India Railway Co. 350 b.h.p. vertical four-cycle heavy oil engine. (See this issue).
NEW DELHI.—January 11th. Stores Department. Electric table fans with flexible cords. (T. 18441/37.)*
December 7th. A.c. ceiling fans and regulators. (T.Y. 18439/37.)*
December 14th. D.c. ceiling fans and regulators. (T.Y. 18440/37.)*

Iran.—Ministry of Posts, Telegraphs and Telephones. Telegraph posts and wiring material. (See this issue).

Irish Free State.—DUBLIN.—August 31st. Electricity Supply Board. Tools for one year. (August 13th.)

Isle of Wight.—NEWPORT.—Standing Joint Committee. Electric lighting at the Police Station. County architect, 62, High Street.

Lancaster.—August 30th. Town Council. Installation of electricity in houses on the Scotforth estate and completion of partly wired houses on the Halton Road estate. F. Hill, city surveyor, Town Hall (deposit £1 1s.).

London.—HACKNEY.—September 29th. Borough Council. Water-cooling tower. (August 6th.)
ISLINGTON.—September 8th. Borough Council. Electric wire, conduits and accessories; and installation of electric lighting in blocks of dwellings (August 6th).
September 14th. Street lamp columns and lanterns. (August 13th.)

Manchester.—August 25th. Electricity Committee. L.p. valves, circulating water pumps and automatic equipment for controlling four boilers. (August 6th.)
August 27th. H.p. steam pipes and receiver. (August 6th.)
September 13th. Markets Committee. Automatic electric passenger and goods lift. City architect, Town Hall (deposit £1 1s.).

Mansfield.—August 23rd. Town Council. Vehicle-actuated traffic signals at the junction of Stockwell Gate with Belvedere Street and Rosemary Street. Waude Thompson, borough engineer, Carr Bank.

Middlesex.—September 6th. County Council. Cooking equipment at the Redhill County Hospital. (August 6th.)

New Zealand.—WELLINGTON.—November 23rd. Public Works Department. 5,000-kVA transformers. (T.Y. 25997/37.)*
September 28th. 40-kW direct-coupled engine driven generating set and accessories. (T.Y. 25999/37.)*
CHRISTCHURCH.—September 9th. Electricity Department. 200-kVA transformers. (T. 18008/37.)*

Northern Ireland.—BELFAST.—August 25th. Ministry of Finance. Electric lighting and power systems and conduits for telephones and bells at the extension of the Parliamentary Buildings, Stormont. Secretary, Ministry of Finance (Room 103), May Street.

Oldham.—August 26th. Gas Works Committee. Three totally enclosed dustproof d.c. motors (25 h.p., 8 h.p., and 5 h.p.). F. Greenhalgh, borough gas engineer, Gas and Water Offices, Greaves Street.
September 6th. Borough Council. Lighting installation at forty-two bungalows. J. Ashurst, borough engineer, Municipal Buildings, 75, Union Street (deposit £1 1s.).

Plymouth.—September 8th. Corporation. Distribution boards and underground network disconnecting boxes. (See this issue.)

Prestonpans.—August 24th. Town Council. Electric lighting at fifty-four houses. R. and A. K. Smith, surveyors, 4, Forres Street, Edinburgh, 3.

St. Helens.—September 4th. Corporation. Twelve double-deck top-covered four-wheel type trolley-buses complete. A. A. Jackson, general manager and engineer, Transport Offices, Hall Street.

Sheffield.—September 10th. Electricity Committee. Two 3-phase banks of 33,000-V oil-immersed reactors. (See this issue.)

South Africa.—JOHANNESBURG.—September 11th. City Council. Electricity meters. (T. 18080/37.)*
CAPE TOWN.—September 1st. Electricity Supply Commission. Cables. (T.Y. 18252.)*
September 8th. Two 10-kVA, three 5-kVA and three 3-kVA transformers, with fittings. (T.Y. 18471/37.)*
PRETORIA.—September 10th. Union Tender and Supplies Board. Telephone switches. (T. 18085/37.)*
September 17th. Public Works Department. Two 250-kVA transformers, cable and four l.v. switches. (T.Y. 18455/37.)* Switchboard wire. (T. 18242/37.)* Tubular electric heaters and thermostats. (T.Y. 18456/37.)*
PORT ELIZABETH.—September 9th. Municipality. Transformer. (T.Y. 18438/37.)*

Stockport.—September 23rd. Corporation. Three 150,000 lb. per hr. boilers with coal bunkers and ash sluicing plant, and one 30,000-kW turbo-alternator with condenser and auxiliary plant. (See this issue).

Sunderland.—August 30th. Corporation. Cables, wire, meters and lamps for twelve months. (August 6th.)

West Ham.—September 6th. Borough Council. Transformers, wires and cables and meters for twelve months. (August 13th.)

West Riding.—August 30th. County Council. Electric lighting and l.p. hot-water apparatus at Thorne Moorends new infants' school and electric lighting and l.p. hot water apparatus at Selby High school. Education Officer, County Hall, Wakefield.
August 28th. Public Health and Housing Committee. Various works, including electrical, at the Harrogate and District General Hospital. West Riding architect, County Hall, Wakefield.
September 1st. Various works, including electrical, at the Child Welfare Clinic to be erected at Rawmarsh, near Rotherham. West Riding architect.

Windsor.—August 26th. Borough Council. Street poles, lanterns, h.p. mercury vapour lamps, time switches and electrical equipment. (August 13th.)

Workington.—August 21st. Corporation. One 200-kVA and one 100-kVA transformers. (August 6th.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Aberdeen.—Housing Committee. Accepted. Electric lighting at eighty-eight houses on the Middlefield housing estate (£506). —R. A. Mair.

Cardiff.—Electricity Committee. Accepted. Sub-station switchgear for Machine Products, Ltd. (£658).—Whitehead Switchgear, Ltd.

Chard.—R.D.C. Accepted. Wiring for electricity at forty-five houses (£139).—A. Paull & Sons.

Dartford.—Electricity Committee. Accepted. Cable (£866).—Hackbridge Cable Co.

Gateshead.—Town Council. Accepted. Automatic telephone system at the Municipal Buildings (£957).—Standard Telephones.

Leicestershire.—County Council Assistance Committee. Accepted. Electrical installation at the Mountsorrel Institution (£423).—F. Webb & Son.

London.—L.C.C. Wiring and fittings for electric lighting, etc., in blocks 1, 1A and 2 to 10 of dwellings on the Tanswell estate, Lambeth :

	£		£
Carr, Bros. Accepted	**3,292**	Samuel Reed and Sons	3,631
Archibald Meckhonik	3,334	Read and Partners	3,694
Jacob, White and Co.	3,367	Bective Electrical Co.	3,777
Coleby and Co.	3,461	Grant and Blake...	3,861
J. L. Shadwell	3,546	F. H. Wheeler and Co.	4,105
City Electrical Co.	3,578	Alexander Hawkins and Sons ...	4,162

Wiring and fittings for electric lighting, &c., in blocks 2 and 3 of dwellings on the Rill Street area, Camberwell :

	£		£
Holliday and Son (Electrical). Accepted	**536**	A. Meckhonik	580
Jacob White and Co.	539	Electrical Installations, Ltd. ...	589
Ellis and Ward	557	A. J. Hewens and Sons	660
Samuel Reed and Sons	575	Alexander Hawkins and Sons ...	696
		Arthur Cozens	1,076

Wiring and fittings for wireless outlet points at Grove Park, St. Charles' and St. Clement's Hospitals and St. Leonard's Hospital and Institution :

	£		£
Alexander Hawkins and Sons. Accepted	**1,539**	W. J. Furse and Co. (London) ...	1,629
Pinching and Walton	1,557	T. Clarke and Co.	1,685
Francis Polden and Co.	1,586	J. E. Swann and Co.	1,695
Buchanan and Curwen	1,612	Archibald Meckhonik	1,850
		A. J. Hewens and Sons	2,197

Wiring and fittings for main switchboard, cable system and electric lighting, power, &c., in block A, administrative block, &c., and the provision of a new fire alarm system at the Fulham Hospital and Institution :

	£		£
Read and Partners. Accepted ...	**3,628**	Holliday and Son (Electrical) ...	4,095
T. Clarke and Co....	3,812	Buchanan and Curwen	4,180
Alexander Hawkins and Sons ...	3,849	Duncan Watson (Electrical Engineers)	4,215
B. French...	3,850	Atozed (Kingston)	4,321
W. J. Furse and Co. (London) ...	3,945	City Electrical Co.	4,400
Electrical Installations, Ltd. ...	4,050		

Wiring and fittings for an automatic telephone system at St. Clement's Hospital, Poplar :

	£		£
Pinching and Walton. Accepted	**1,155**	Automatic Telephone and Electric Co.	1,269
Ericsson Telephones	1,180	Holliday and Son (Electrical) ...	1,279
Standard Telephones and Cables	1,242	W. J. Furse and Co. (London) ...	1,314
Samuel Reed and Sons	1,255	Alexander Hawkins and Sons ...	1,339
Reliance Telephone Co.	1,257 (less 2½%)	Ellis and Ward	1,365
		G. E. Taylor and Co.	1,461

Wiring and fittings for alterations and additions to the electric lighting and power and extension of wireless systems, &c., in connection with the adaptation of accommodation at Woolwich Institution :—

	£		£
A. Meckhonik. Accepted ...	**1,270**	Electrical Installations, Ltd. ...	1,415
Samuel Reed and Sons	1,307	Buchanan and Curwen	1,490
W. J. Furse and Co. (London) ...	1,315	Francis Polden and Co.	1,501
Pinching and Walton	1,323	Arthur Cozens	1,571
Holliday and Son (Electrical) ...	1,373		

Wiring and fittings for electric lighting, &c., at elementary schools : Grafton Road, Islington, N. :

	£		£
F. Troy and Co. Accepted ...	**841**	L. G. Tate and Co.	1,129
Archibald Meckhonik	966	Jacob White and Co.	1,142
City Electrical Co.	1,081	Buchanan and Curwen	1,144
Pinching and Walton	1,116	Arthur Cozens	1,157
J. E. Swann and Co.	1,124	Bower Engineering Works ...	1,250

Huntingfield, Putney :

	£		£
Pemberton and Sturgess (Great Britain). Accepted	**863**	J. E. Swann and Co.	965
Francis Polden and Co.	933	L. G. Tate and Co.	991
Holliday and Son (Electrical) ...	947	H. J. Cash and Co.	998
Buchanan and Curwen	952	Archibald Meckhonik	1,164

Roman Road, Bow and Bromley :

	£		£
Springvale Electrical Co. Accepted	**1,019**	Archibald Meckhonik	1,526
Buchanan and Curwen	1,294	Holliday and Son (Electrical) ...	1,654
Harland and Wolff	1,410	Ilford Electrical Co.	1,712

Sigdon Road, Hackney, C. :

	£		£
Archibald Meckhonik. Accepted	**1,464**	Berkeley Electrical Engineering Co.	1,828
Pinching and Walton	1,513	G. E. Taylor and Co.	1,836
Carr Bros.	1,545	Electrical Installations, Ltd., ...	1,864
Grant and Blake...	1,559	Francis Polden and Co.	1,882
Holliday and Son (Electrical) ...	1,659	H. J. Cash and Co.	1,932
Buchanan and Curwen	1,804		

Middlesbrough.—Town Council. Accepted. Circuit-breakers for three sub-stations.—English Electric Co. Cable.—Hackbridge Cable Co.; Enfield Cable Works.

Sowerby (Yorkshire).—U.D.C. Accepted. Electrical work at fifty-eight houses to be erected on Beechwood estate.—A. H. Bowyer.

Stoke-on-Trent.—Assistance Committee. Accepted. Refrigeration plant for Turnhurst Institution (£313).—General Electric Co.

Uttoxeter.—U.D.C. Accepted. Overhead supply line to the pumping station at Crumpwood (£924).—Johnson & Phillips.

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following :—

DURABILT folding iron (British agent's name wanted).

Readers should enclose stamped addressed envelopes when making their inquiries.

Notes

Fatality

An inquest was held at Oxendon on August 13th on Cecil Arthur Reynolds, of Desborough, who received a fatal electric shock when cutting grass in his father's garden at Oxendon. Reynolds had been using shears on a strip of grass near the kitchen window, and was found dead clutching an earth wire running down the wall. Leonard Walter Bale, electrician, Great Oxendon, gave evidence of installing a 15-A switchbox and plug in the house in September last, and of connecting the earth point of a hot plate installation with the earth wire in question. He admitted that the switch he fitted was in the black wire, but was confident that the switch was fitted properly. The earth plate was put in by electrical contractors. Evidence was given by Clifford Binns, distribution engineer, of Kettering Electricity Department, who examined the earth wire. He said the wire was a bare copper one to carry leakages to earth. A single-pole switch was used for the hot plate. When the plug for the plate was in position there would be a leakage, and with a faulty earth plate the earth wire would become "alive." The switch was faulty but would not make the earth wire "alive" had there not been a leakage in the boiling plate, or hot plate, in which there was a fault. He found faults in the boiling plate and the switch. The earth plate was of no value whatever as a conductor. It was not large enough, and not buried deep enough. The combination of faults would cause the earth wire to be "alive." It was the custom to have such wires outside the house without protection. Witness said that the Council was under no obligation to inspect wiring or apparatus at the Oxendon houses. It was not the Council's duty but its practice to observe requests for tests. An installation engineer of the Kettering Electricity Department said that when he tested the hot plate he found a slight leakage in the outer ring. The fault was one over which there was no control and it was a fault which might occur at any time. A verdict of "Death by Misadventure" was returned, the jury making a recommendation that such earth wires should be protected.

Supervisors' Outing

Recently a party of members of the Association of Supervising Electrical Engineers visited the London and Home Counties Joint Electricity Authority's meter testing and recording station at Burford (Box Hill). Mr. F. W. Purse, chief engineer, gave a brief account of how the J.E.A. came to secure the fine eighteenth-century mansion now established as a centre for meter testing and reconditioning of cookers, as well as for demonstration and display purposes. Mr. C. W. Hughes, superintendent in charge, described the work which was being done at the centre. The outward appearance of this quiet and dignified country mansion has been completely preserved, and, while something of the old-world atmosphere is retained in the rooms upstairs (now used as storage rooms and offices, including a room for the printing plant for the Authority's stationery and forms), the ground floor has to some extent been modernised to accommodate the showroom and demonstration theatre, and by a number of well-planned alterations the outhouses (once the dairy, stables, cowbyres, and piggeries) have been converted into the meter-testing and cooker-renovation departments.

Radio Research in New Zealand

A *Reuter* message from Wellington, N.Z., states that a grant of £2,500 a year for three years is to be made by the New Zealand Government towards the work of the New Zealand Radio Research Committee, appointed recently by the Government. The Committee, which has already started its work, will concentrate on three main lines of investigation. These are: The ionosphere; the reception of distant signals involving measurements of direction of arrival, angle of incidence and polarisation; and the ground attenuation of waves under New Zealand conditions.

Italian Electrical Conference

The annual conference of the Italian Association of Electrical Engineers is to be held at Bari during next month. Over sixty papers will be read at the conference, the work of which will be divided into various sections. In the overhead power transmission line division there are about twenty papers, among them being one by Signor A. Giarola on electric power distribution lines in agricultural areas and one by Signor L. Selmo on testing and maintenance of h.v. transmission lines.

Appointments Vacant

Assistant mains engineer for Eastbourne Electricity Department.

Electrical testing assistant at the Royal Air Force Establishment, Dhibban, Iraq.

Mechanical and electrical engineer for the Government of the Gold Coast.

Engineer at Suttons Institution, Hornchurch, for the Essex C.C.

Assistants, Grade III, at the Royal Aircraft Establishment, South Farnborough.

Mains assistants in the drawing office, Works Directorate, Air Ministry.

Junior mechanical draughtsman for Surrey C.C.

Lady demonstrator for Stoke Newington Electricity Department.

Part-time teachers at East Ham Technical College.

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. W. K. G. Allen has been appointed a director of W. H. Allen, Sons & Co., Ltd., thus inaugurating a third generation of the family on the board. He is a grandson of the late Mr. W. H. Allen, who founded the firm in 1880, and is the eldest son of Mr. H. G. Allen. The three other members of the board, Mr. R. W. Allen (chairman), Mr. H. G. Allen (deputy chairman) and Mr. R. S. Allen (managing director) are sons of the founder.

Mr. W. K. G. Allen

Mr. W. Morris, Assoc. M.Inst.C.E., of Withington, Manchester, has been appointed the city engineer and surveyor of Hull at a salary commencing at £1,400 a year and rising to £1,800. Mr. Morris is forty-one years of age. He served with the (E.L.) Royal Engineers during the war. In 1931 he was appointed deputy city engineer and surveyor at Hull. He is president of the Hull Branch of the N.A.L.G.O.

Prof. W. M. Thornton, O.B.E., D.Sc., D.Eng., as we have already announced, is retiring from the Chair of Electrical Engineering at Armstrong College, Newcastle-upon-Tyne, in September, and an organising committee, representative of all electrical and allied interests on the North-East Coast, has been formed to collect subscriptions for a presentation. The arrangements for making the presentation will be intimated at a later date, but the committee is of opinion that it should take the form of a cheque, together with some tangible token suitably inscribed. Subscriptions should be sent, or given personally, to either Mr. H. Sherlock, North-Eastern Electric Supply Co., Ltd., Carliol House, Newcastle-upon-Tyne, or Mr. R. H. Davison, A. Reyrolle & Co., Hebburn-on-Tyne, the joint honorary secretaries. Cheques should be made payable to Mr. Sherlock. The subscription list will close on October 30th. Prof. Thornton is to have the title of Emeritus Professor conferred upon him by the Council of Armstrong College from the date of his retirement.

L.M.S. Appointments.—Following the decision of the board of directors of the London, Midland and Scottish Railway Co. to amalgamate the Electrical Department with the Chief Mechanical Engineer's Department, **Mr. C. E. Fairburn,** the present electrical engineer, has been appointed deputy chief mechanical engineer and electrical engineer. **Mr. R. A. Riddles,** principal assistant to the chief mechanical engineer, has been appointed mechanical and electrical engineer, Scotland, and **Mr. F. A. Harper** has been appointed principal assistant to the chief mechanical engineer for electrical engineering.

Mr. S. A. Tomlin has been appointed sales manager for Switchgear & Meters, Ltd., and commences his duties with this company on September 1st.

Mr. T. V. Lironi has resigned his position as assistant mains engineer with the Eastbourne Corporation in order to take up an appointment with the Wolverhampton Corporation as mains assistant early next month. Before going to Eastbourne in June, 1935, he had held the post of general assistant to the engineer and manager of the Westmorland and District Electricity Supply Co., Ltd., since December, 1933, prior to which he was in the Contract Department of Johnson & Phillips, Ltd. He served his apprenticeship with the Gosport and Alverstoke Electric Lighting Co. and the Gosport and Fareham Tramways, and before joining Johnson & Phillips in 1929 he spent six months as a temporary assistant in the Portsmouth Corporation Electricity Department.

Sir Ernest W. Petter has resigned from the chairmanship of Westland Aircraft, Ltd., owing to ill-health.

Mr. C. Spurr, chief assistant engineer to the Sunderland Corporation Electricity Department, has been appointed deputy borough electrical engineer, with an increase in salary from £737 to £769 per annum.

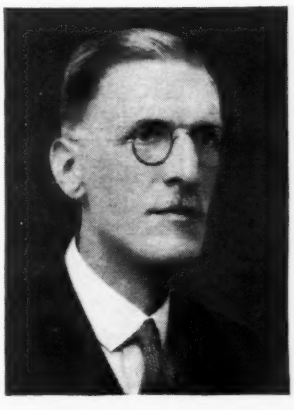
Mr. L. D. Wright, illumination engineer to the Victorian State Electricity Commission, is to visit Europe to study modern developments in street lighting. He will visit the Paris Exhibition, the Leipzig World Fair, and the Engineers' and Marine Exhibition in London. Afterwards he will make a tour of the United States.

Mr. R. G. Hancock, assistant mains engineer to the Darlington Corporation, has secured another appointment with the Bradford Corporation.

Mr. Harold Spitteler has been appointed assistant electrical engineer to the Admiralty. He was formerly with the Central Electricity Board.

Obituary

Mr. J. E. Tapper.—We regret to record the death of Mr. John Edward Tapper, M.I.E.E., the borough electrical engineer of Beckenham, which occurred in a nursing home at Truro on August 16th, at the age of sixty-one years. Mr. Tapper commenced his electrical career with the Brighton Corporation in 1899, and after some experience of running electrical plant for a private firm joined the Beckenham Electricity Department as chief assistant engineer, being promoted to chief engineer in 1904. When the undertaking was taken over by the Beckenham Urban District Council in November, 1905, Mr. Tapper became engineer and manager, which position he held until September, 1935, when Beckenham was made a borough, and he became the borough electrical engineer. During the period of Mr. Tapper's management the undertaking showed considerable advance, the number of consumers increasing from 400 in 1904 to 15,500 in 1937, and sales of electricity from 300,000 kWh to 20,000,000 kWh. Mr. Tapper was a member of the I.M.E.A. and a member of the A.M.E.E., of which he was hon. secretary for many years and president for the current year. He represented the Borough Council on the Joint Industrial Board and the National Joint Board, the British Engineering Standards Association, various committees of E.D.A., and at the conference of local authorities owning electricity undertakings in Greater London.



The late Mr. J. E. Tapper

Wills.—Mr. A. F. Bennett, formerly a director of Richard Garrett & Sons, Ltd., left £20,243, with net personalty £18,738.

Mr. R. C. Irwin, a director of the Altrincham Electric Supply, Ltd., left £57,953 (net personalty £54,530).

Mr. J. H. Wild, a director of Nathan & Allen, left £16,311 (net personalty £14,399).

Edison's Notebooks

More than 2,000 of Edison's notebooks and also the marginal comments made by the inventor in many of his 11,000 library books are to be preserved by photography and cataloguing at West Orange, N.J. The contents of the laboratories are to-day practically as they were at the time of his death in 1931, except that certain notepads with paper of a poor quality are beginning to disintegrate. The *Telegraph and Telephone Age* states that when these have been photographed they will be placed in an airtight vault.

Pulling Skiers up Mountains

Apart from electrically operated cable railways and aerial ropeways, several tow-rope installations known as ski-lifts have recently been completed in Switzerland to allow skiers to reach good practice slopes at high altitudes rapidly and without exertion. An installation of this kind at Suvretta (St. Moritz) was built to the patents and under the supervision of M. E. Constam, of Zollikon, near Zurich. The length of the line is 2,624 ft. and the difference in altitude between the lower and upper stations is 852 ft. When fully utilised the line can take up 450 people per hour. An endless cable is carried by supports on the slope and round two drums at the terminal stations. Cleverly devised book-shaped rests allow the traveller to be towed along on skis without danger or effort. The lower of the two cable drums is driven by a Brown-Boveri 47-kW three-phase induction motor. A seven-step controller is used to start the motor and, if necessary, to regulate the towing speed. The haulage machinery is provided with a braking device with electromagnetic control and a switchbox with thermal releases protects the motor drive against overloads; it also cuts out the drive in case of failure of the current or if the stop switch at the top end is actuated. Two other tow-ropes built in accordance with the Constam patents and equipped by the Compagnie Electro-Mécanique, of Paris, have been installed in the French Alps.

Swiss Electrical Trade

Declining exports

IN one of Switzerland's leading lines of electrical exports—meters and measuring instruments—a decline in value last year of 476,000 fr. was more than offset by increases of 310,000 fr. in exports of dynamo electric machines and of 470,000 fr. in unspecified electrical apparatus. There were, however, decreases also in exports of accumulators, radio apparatus and lamps.

On the import side there were declines almost throughout, the total value of dynamo-electric machine imports, at 1,411,000 fr., comparing with an export value amounting to 9,026,000 fr. The following table shows the values of imports and exports, by countries of origin or destination, of the chief groups, with notes of increases or decreases compared with 1935. The rate for the Swiss franc is about 25 to the £ at par and 21½ to the £ current.

	1936. Swiss fr. (000).	Inc. or dec. on 1935. Swiss fr. (000).
EXPORTS.		
Accumulators—		
Total ...	350	− 247
To France	100	− 291
„ Canada	19	+ 7
„ Italy ...	27	− 22
„ Germany	127	+ 102
Insulators—		
Total ...	224	+ 168
To Spain...	8	− 1
„ Ireland	7	+ 5
„ United Kingdom	172	+ 172
Meters and measuring instruments—		
Total ...	10,574	− 476
To France	2,557	− 153
„ Belgium	982	− 88
„ Holland	972	− 153
„ United Kingdom	1,262	+ 202
„ Spain...	427	− 313
„ Italy ...	534	− 126
„ Czechoslovakia	682	+ 28
Telephone and telegraph apparatus—		
Total ...	667	+ 299
To Italy ...	91	+ 12
„ Belgium	44	− 8
„ Great Britain	137	+ 73
„ Netherlands E. Indies	103	+ 81
Radio apparatus—		
Total ...	152	− 148
To France	49	+ 11
„ Germany	46	− 36
Glass rectifiers, with or without mercury—		
Total ...	57	− 22
Unspecified electrical apparatus, over 500 kg.—		
Total ...	1,391	+ 414
To Australia	437	+ 430
Unspecified electrical apparatus, 50 kg. to 500 kg.—		
Total ...	1,371	− 210
To France	258	− 42
„ Spain...	62	− 68
„ India ...	22	− 128
„ Italy ...	76	− 4
„ Argentina	147	+ 95
Unspecified electrical apparatus, 3 kg. to 50 kg.—		
Total ...	2,850	+ 292
To France	539	+ 69
„ Spain...	92	− 58
„ Italy ...	347	− 153
„ Holland	225	+ 103
„ Spain...	92	− 58
„ Germany	334	+ 135
Unspecified electrical apparatus, under 3 kg.—		
Total ...	875	− 26
Dynamo-electric machines—		
Total ...	9,026	+ 310
To France	1,176	− 234
„ Italy ...	567	− 703
„ Spain...	294	− 516
„ India ...	391	− 79
„ Canada	250	− 90
„ Argentina	413	+ 93
„ Brazil	240	—
„ China...	153	− 127
„ Germany	465	− 135
„ Peru ...	535	+ 450
Electric locomotives—		
Total ...	38	− 116
Insulated wire and unarmoured cable—		
Total ...	293	+ 22
To Italy ...	68	− 12
Cable, not lead covered—		
Total ...	118	+ 17
Electric incandescent lamps—		
Total ...	512	− 232
To Germany	464	− 208
IMPORTS.		
Accumulators—		
Total ...	264	− 84
From Germany ...	104	− 6
„ France	79	− 31
Insulators—		
Total ...	116	− 41
From Germany ...	65	− 25
„ Denmark ...	31	− 27
Meters and measuring instruments—		
Total ...	904	− 102
From Holland	57	+ 17
„ Great Britain	79	+ 23
„ United States	95	—
„ Germany ...	495	− 65
Telephone and telegraph apparatus—		
Total ...	1,476	− 150
From Germany ...	608	− 162
„ Belgium ...	825	+ 35
Radio apparatus—		
Total ...	4,646	− 2,001
From Germany ...	1,630	+ 210
„ Holland ...	1,360	− 1,900
„ United States	630	− 80
Glass rectifiers with or without mercury—		
Total ...	56	− 9
From Belgium ...	14	− 9
„ Holland ...	15	− 1
Unspecified electrical apparatus, over 500 kg.—		
Total ...	63	+ 26
From Germany ...	31	− 1
Unspecified electrical apparatus, 50 kg. to 500 kg.—		
Total ...	119	− 43
From Germany ...	39	− 47
„ France ...	33	+ 5
Unspecified electrical apparatus, 3 kg. to 50 kg.—		
Total ...	331	− 104
From Germany ...	222	− 38
„ France ...	37	− 6
„ United States ...	21	− 26
Unspecified electrical apparatus, under 3 kg.—		
Total ...	761	− 89
From Germany ...	592	− 128
„ France ...	55	+ 18
Dynamo-electric machines—		
Total ...	1,411	− 670
From Germany ...	666	− 44
„ France ...	256	− 154
„ Italy ...	46	− 150
„ Holland ...	53	− 153
„ United Kingdom ...	128	+ 37
Insulated wire and unarmoured cable—		
Total ...	64	− 73
From Germany ...	19	− 40
„ France ...	1	− 23
„ Holland ...	32	− 10
Cable, not lead-covered—		
Total ...	225	− 53
From Germany ...	133	− 60
Cable, lead-covered—		
Total ...	75	− 73
From Germany ...	62	− 59
Electric incandescent lamps—		
Total ...	2,126	+ 102
From Germany ...	600	− 24
„ Holland ...	952	− 13
„ Austria ...	200	− 40

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Grove Radio, Ltd.—Private company. Registered August 12th. Capital, £500. Objects: To carry on the business of manufacturers of and dealers in wireless apparatus, cabinets, &c. The directors are: A. Eberst and Mrs. E. Eberst, both of 91, Fairholt Road, Stamford Hill, N.16. Secretary: S. D. Kamlet. Registered office: 45, Church Street, Stoke Newington, N.16.

Michael, Son & Caine, Ltd.—Private company. Registered August 13th. Capital, £500. Objects: To carry on the business of electrical contractors and engineers, mechanical, water and gas engineers, &c. The subscribers are: W. T. Hawke, 12, Shaftesbury Road, Romford, and F. J. Shearman, 40, Milton Road, Romford. Solicitor: W. A. Foster, 24, Ryder Street, S.W.1.

Yorkshire Aluminium, Ltd.—Private company. Registered August 13th. Capital, £1,000. Objects: To carry on business as smelters of ores, aluminium, alloys and residues, &c. The permanent directors are: E. L. Midgley, 638, Abbey Lane, Parkhead, Sheffield, 11, and H. H. Wardle, Stone House, Allesley, Coventry. Registered office: Spartan Works, Carlisle Street, Sheffield, 4.

Weldaneon Signs, Ltd.—Private company. Registered August 14th. Capital, £1,000. Objects: To carry on the business of manufacturers and maintainers of neon, daylight, box, metal, electric and other signs, &c. The directors are: R. H. Haswell, 7, Gledhow Park Crescent, Leeds, 7, C. Dale, 29, West Park Drive, Leeds, 8, and T. Moore, 308, Stambeck Road, Leeds, 7. Registered office: Marshall Mills, 125, Water Lane, Leeds, 11.

Aric, Ltd.—Private company. Registered August 14th. Capital, £12,000. Objects: To carry on the business of manufacturers of and dealers in gauges, valves, indicators, instruments and tools of all kinds, engines and motors; aviation, automobile, marine, electrical and radio engineers, &c. The directors are: R. N. Reid (permanent managing director), "Dingley Dell," Avenue Road, Teddington, Middlesex, and H. Bulstrode, 37, Castle Avenue, Ewell, Surrey. Solicitors: Walbrook & Hosken, 4, St. Paul's Churchyard, E.C.4.

Returns of Electrical Companies

L. Weekes (Luton), Ltd.—The nominal capital has been increased by the addition of £4,000 in £1 ordinary shares beyond the registered capital of £6,000.

Radio (Hove), Ltd.—Arthur C. Gillman, of 103, Cannon Street, E.C.4, ceased to act as receiver and/or manager on July 6th, 1937.

Pontypridd Wireless Service, Ltd.—Ivor F. L. Johns, of 30, Stowe Hill, Newport, Mon, was appointed receiver and manager on August 4th, 1937, under powers contained in debenture dated June 15th, 1937.

H. C. Troldahl, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated August 2nd, 1937, to secure all moneys due or to become due from the company to Martin's Bank, Ltd.

Anglo-American Telegraph Company, Ltd.—Capital £7,000,000 in £226,300 ordinary stock, £3,386,840 preferred ordinary stock, and £3,386,840 deferred ordinary stock. Return dated June 3rd, 1937. All stock taken up. £600,000 paid. £6,400,000 considered as paid. Mortgages and charges, nil.

Higgs Motors, Ltd.—Capital, £100,000 in £1 shares. Return dated April 5th, 1937. 71,000 shares taken up. £7,860 paid. £63,140 considered as paid. Mortgages and charges nil.

London Auto-Electric, Ltd.—Capital, £1,000 in 300 preferred and 700 ordinary shares of £1. Return dated December 31st, 1936 (filed July 6th, 1937). 700 ordinary shares taken up. £700 paid. Mortgages and charge £500.

R. & P. Electrical Co., Ltd.—Capital, £1,000 in £1 shares. Return dated May 18th, 1937. All shares taken up. £1,000 paid. Mortgages and charges nil.

Brand Electrical & Engineering Co., Ltd.—Capital, £2,000 in 1,000 7 per cent. preference and 1,000 ordinary shares of £1. Return dated April 1st, 1937. 800 shares taken up. £800 paid. Mortgages and charges nil.

Edison Swan Cables, Ltd.—Satisfaction to the extent of £100,000 on July 30th, 1937, of debenture dated December 5th, 1932, and registered December 21st, 1932. According to the register of mortgages, the debenture registered December 21st, 1932, originally secured £200,000.

J. Carter, Sons & Co., Ltd.—Three debentures charged on the company's property, present and future, including uncalled capital, dated August 3rd, 4th and 5th, 1937, to secure £145, £150 and £100 respectively. Holders: (a) Thos. W. Frost, Cleadon, Dale Road, Marple, (b) James G. Henderson, 14, Acre Lane, Cheadle, Hulme, Ches, and (c) Mrs. Ellen S. Potter, 15, Mayfield Road, Timperley, Ches.

Superlamp, Ltd.—Charges, dated August 23rd, 1929, February 24th, 1930, April 10th, 1935, and December 24th, 1932, for £380, £185, £1,400, and £6,600 owing respectively, charged on (a) 805, High Road, Leyton (leasehold); (b) 62, Turnpike Lane, Hornsey (freehold); (c) 14, Market Street, Worthing, and 82, Queen's Road, Watford (freehold); and (d) 38 and 38a, Gloucester Road, Brighton, and 62, Turnpike Lane, Hornsey (freehold), and 143, New Cross Road, Deptford, and 805, High Road, Leyton (leasehold), (being property acquired by the company on July 26th, 1937). Registered pursuant to Section 81 of the Companies Act, 1929. Holders: (a and b): Joseph Solomon, 58, Finsbury Pavement, E.C.2. and Annette K. Solomon, 46, Vernon Court, Hendon Way, N.W.2, and (c and d) Spencer Orgel and Calman J. Orgel, both of 6, Paul Street, Finsbury, E.C.

Aerodyne Radio, Ltd.—Wm. H. Cork, of 19, Eastcheap, E.C., was appointed receiver and/or manager on August 10th, 1937, under powers contained in debenture dated June 1st, 1937.

Nelson & District Wireless Service, Ltd.—Capital, £400 in £1 shares. Return dated May 21st, 1937. 300 shares taken up. £300 paid. Mortgages and charges nil.

Monmouth Electricity Co., Ltd.—Capital, £35,000 in £1 shares. Return dated July 5th, 1937. All shares taken up. £35,000 paid. Mortgages and charges nil.

Aidas Electric, Ltd.—Capital, £1,000 in £1 shares. Return dated May 1st, 1937. All shares taken up. £1,000 paid. Mortgages and charges: £7,500.

Bideford & District Electric Supply Co., Ltd.—Capital, £140,000 in £1 shares. Return dated May 7th, 1937. 135,000 shares taken up. £123,400 paid, £11,600 considered as paid. Mortgages and charges: £95 19s. 6d. (bank overdraft).

G. Ellam, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated July 28th, 1937, to secure £1,000. Holder: G. Ellam, 67, Moss Bank, Higher Crumpsall, Manchester.

District Electric Ltd.—The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £1,000.

Eastnor Electric Co., Ltd.—Satisfaction to the extent of £550 (whole amount issued) on July 16th, 1937, of series of debentures authorised by resolution dated January 7th, 1936, and registered January 25th, 1936.

Nigerian Electricity Supply Corporation, Ltd.—Satisfaction to the extent of £7,416 on June 30th, 1937, of trust deed dated August 24th, 1933, and registered August 31st, 1933, securing £300,000 6 per cent. first mortgage debenture stock.

City Notes

The County of London Electric Supply Co., Ltd.—An extraordinary meeting was held on August 16th at which a resolution was passed approving an agreement between the City of London Electric Lighting Co., the County Company, the South Metropolitan Electric Light & Power Co., and the South London Electric Supply Corporation. Sir Bernard E. Greenwell (chairman), who presided, said the agreement had been approved by the Electricity Commissioners, and in order to obtain advantage of the agreement in the coming winter it would be necessary to put certain engineering works in hand at once. The South Metropolitan and the South London companies were associated companies of the County Co., so that the question of amalgamation or acquisition did not arise. Those three companies had been working for years under practically the same board of directors and the same management, and their policy, on both commercial and the engineering sides, had been the same. The effect of the agreement was to bring the City of London Co. into that joint working arrangement; the County Co. was enabled to give bulk supplies to the City Co., which would enable that company to deal with certain important supplies in the City which it had been unable to deal with up to now. Replying to questions Sir Bernard said that with regard to the McGowan Committee, the White Paper did not really affect the big companies, but rather the small companies and corporations. Although the directors did not quite agree with the White Paper, it was a fact that the Electricity Commissioners and the Government had tried to cheapen and make available the supply of electricity throughout the land. He hoped that the Government Bill would straighten out a lot of the unworkable parts of the White Paper, which they thought was not on all-fours with the Report of the McGowan Committee.

At extraordinary meetings of the South Metropolitan and the South London companies the scheme was approved. The meeting of the City of London Co. to consider the arrangement will be held in September.

The Prussian Electric Co., which is controlled by the State of Prussia, through Vereinigte Elektrizitäts-und Bergwerks-A.G., reports a gross profit for the year to March 31st of Rm.20,424,697, as compared with Rm.18,030,654 for the preceding year. To this is added revenue from participations, Rm.6,366,696, sundry capital revenue, Rm.131,804, and extraordinary revenue Rm.4,010,299. After deducting wages, taxes, and allocations to various reserves, &c., the net profit is Rm.6,373,798 (Rm.5,679,237), to which is added Rm.491,174 brought in. A dividend of 6 per cent. is paid (against 5 per cent.), and Rm.264,972 is carried forward.

J. & F. Stone Lighting & Radio is paying a final ordinary dividend of 11½ per cent., making 17½ per cent. for the year (against 12½ per cent. on smaller capital).

Brilliant Signs, Ltd., is paying the dividend on the cumulative preference shares for the period to September 1st, 1937, at the rate of £1 10s. 8d. (less tax) per 100 shares, in accordance with the terms contained in the offer for sale.

The Telephone & General Trust, Ltd.—Particulars were published on Thursday last week in compliance with Stock Exchange regulations of an issue of £200,000 4 per cent. first debenture stock, 1957-67. This stock, which forms the first part to be issued of an authorised total of £400,000, has been placed privately at £98⅝ per cent.

Ismay Industries report a gross income for the year ended June 30th of £68,144. For the period from April 11th, 1935 (the date of incorporation of the company), to June 30th, 1936, the total income was £53,448. But the dividends received from the subsidiary companies represented the earnings of those companies for a period of approximately one year only. The profit, subject to tax, was £65,300, from which was deducted for tax £12,916. It is proposed to pay an ordinary dividend of 6 per cent., and to carry forward £12,444, against £1,350 brought in.

Stocks and Shares

TUESDAY EVENING.

STOCK EXCHANGE markets have fallen under the sobering influence of grave news from the Far East. It may be difficult to see any particular connection between a clash of arms in China and the activities of most of the industrial companies operating at home, but the disinclination of the public to take any particular interest in stocks and shares during the holiday month serves to emphasise the effect produced by apprehensions of what may be the outcome of the China-Japan trouble. The disposition of markets as a whole is dull. The promise of activity with which August opened has not been fulfilled. Stock Exchange members, brokers and jobbers alike find that business has dawdled to something like a standstill. In such circumstances, the tendency of prices is to drift downwards. Until prospective purchasers change their present policy of inaction prices are likely to remain on the heavy side. The excellent Board of Trade returns were allowed to pass almost without notice, so lethargic is public interest in stocks and shares.

City and County

Official confirmation is now forthcoming of the working agreement that is to be established between the City of London Electric Lighting Company and the County of London Company. Rumour circulated this idea several weeks ago and it was received with a certain amount of credence, looking, as it did, a reasonable arrangement to expect. The Electricity Commissioners have given their consent; the City of London shareholders are to be called together next month to sanction the arrangement; the County of London, with its two subsidiaries—the South London and the South Metropolitan companies—notified their approval at meetings held on Monday in the present week. The chairman of the County Company pointed out, at the meeting, that the agreement is in the nature of a working arrangement and not an amalgamation or acquisition. He added that, in his opinion, the recently issued White Paper did not affect the big companies.

Transport "C"

London Passenger Transport "C" stock is in the limelight at present. Some people are advocating its sale with a view to the money being re-invested into other Home Railway stocks deemed to offer wider scope for price appreciation. Another set of opinions regards the outlook for the stock as being sufficiently promising to make a purchase worth while at the current price of 82¾. The stock at present is receiving 4 per cent. per annum and giving a yield of £4 17s. 3d. per cent. Under the terms of the original arrangement, the "C" stock is entitled to interest at 5 per cent. for the first two years, thereafter 5½ per cent., rising to a maximum of 6 per cent. Holders in the aggregate of not less than 5 per cent. of this, or the other classes of stock, may apply to the High Court for the appointment of a receiver if the Board defaults in payment of interest for a period, in the case of the "C" stock, of three consecutive years, excluding the first two years; a clumsy way of putting it, and one which is not in the least likely to become operative. It does imply, however, the possibility of the "C" stock receiving 5½ per cent., if the Board can possibly afford to squeeze it out of earnings, either this year or next.

According to the balance sheet at the end of June, 1936, the substantial sum of £6,400,000 was standing to the credit of renewal reserves. To pay an extra 1 per cent. on the "C" stock takes less than £300,000; and, from the way in which the Board are piling up the reserves, it might be thought that a payment of 5½ per cent. within the next year or two

on the "C" stock is being kept in mind. The bus strike probably did not cost the Board any material sum, but the rise in costs of materials is a factor which cannot be ignored. These considerations invest the "C" stock with a good deal of interest. They account for the comparative activity which prevails in the market at the present time.

American Affairs

The underlying optimism of transatlantic markets came to the front at the beginning of this week, accompanied by revival of activity in the popular stocks. Although restraint was imposed by the complicated state of affairs in Washington, and by the possibility that the adjournment of Congress may still be some distance away, the continuance of good business news was allowed to have its way with stock quotations. A leading part was taken by Radio Corporation shares, a counter popular with speculators on both sides of the Atlantic. The price jumped to 11⅝ on talk that the company is likely to declare a dividend for the first time since its inception eighteen years ago. Other communication and utility stocks lagged behind industrial descriptions. It is reported that America is to ask for international assistance in the Government programme for the control of "hot" money, the descriptive term given to funds from abroad liable to sudden withdrawal. Present plans include a revival of the scheme for taxing capital profits realised by foreigners on deals in American stocks, or for increasing taxation on alien investments.

Manufacturing and Equipment

Mid-August apathy, heightened by the far Eastern situation, has deprived industrial markets of most of the interest which arose, rather surprisingly, in the first part of the month. With few buyers in sight, it is not surprising to find a moderate amount of selling having its way with share-prices. Subsidence of activity in Home industrial issues has left most of the speculative variety out of the picture. What interest remains is mostly of the investment kind, and is chiefly occupied with the sounder class of shares. That being so, electrical equipment descriptions continue to claim a good deal of the available business, although the volume of the latter has been insufficient to influence, except in one or two instances, the course of share-prices. The market is not without its features. Siemens advanced to 35s. before reacting to 33s. 9d. Crompton Parkinsons, in rising ½, again reached the £3 mark; Brush ordinary hardened to 50½. Ericssons, having added ½ to the preceding week's jump of 5s., have now reached 55s. Dealings have taken place in comparatively lively fashion in Lancashire Dynamos, the subject of optimistic interim-dividend forecasts. The price of the shares, having been over 75s., is now 73s. 9d., as compared with 67s. 6d. a fortnight ago.

Miscellaneous Matters

The gilt-edged market has remained tolerably steady, assisted by the expectation of a slackening in the issue of fresh Corporation loans. Little change either way is shown in the prices of Government stocks, or in those of Public Boards and similar undertakings, although London Transport "A" is a point lower, at 114½. The list of electricity supply shares shows few alterations. Where prices are changed at all, the movement is generally upwards, as in the case of "City Lights" at 34s. 6d., North Metropolitans 49s. 3d., Midland Counties 37s., and one or two others. The July electricity output figures were a helpful factor to prices in this market. Cable and Wireless ordinary lost most of the recent rise, but the preference and funding issues are unchanged. Globe Telegraph ordinary put on 10s. to 16⅝; Marconi-Marines reacted to 37s. 6d. Iron, steel and engineering descriptions shared with electrical equipment issues such honours as were going in industrial markets. After a small burst of activity in radio shares, following the decision to raise prices of receivers, interest quickly subsided, leaving "Emmies" at 21s. 9d. and E. K. Coles at 16s.

Bucket Shops

Most official reports on matters of public interest are fully expected to meet with mixed receptions, and last week's Departmental Committee's recommendations on the subject of share-pushing proved no exception, so far, at least, as Stock Exchange opinion was concerned. The Committee's difficulty has been, of course, to manufacture a net to snare the bucket-shops without interfering, at the same time, with the legitimate and useful institutions. Comment is somewhat sceptical regarding the Committee's principal recommendations that outside brokers, other than members of recognised Stock Exchanges, should be compelled to seek registration, subject to satisfactory references and securities, on a special Board of Trade register. Critics of the report have made free use of the metaphor, usual on these occasions, of driving coach and horses through the loop-holes. A more general welcome was given to that part of the report recommending a tightening up of the provisions and administration of the laws relating to share-pushing. Most people would be glad to see a good deal more scope and power given in these matters to the arm of the law, and a greater severity in the prosecution of offenders. Taken all round, the proposals are welcomed as a useful step forward in protection of those whose gullibility makes them lucrative prey to a particularly mean type of fraud.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Last.	Price Aug. 17.	Rise or Fall.	Yield p.c. £ s. d.
Home Electricity Companies.						
Bournemouth and Poole	1	15	15	67/6	—	4 9 0
City of London	1	7½	7½	34/6	+6d.	4 7 0
Clyde Valley	1	7	8	39/6	+6d.	4 1 1
County of London	1	10½	10½	50/-	—	4 4 0
Edmundson's 7% Pref.	1	7	7	33/6	—	4 3 7
Do. Ord.	1	8	9	39/-	—	4 12 4
Elec. Dis. Yorkshire	1	9	9	41/-	—	4 7 10
Elec. Fin. and Securities	1	12½	12½	2 3/16	—	4 13 0
Elec. Supply Corporation	1	11	12	52/6	—	4 11 5
Lancs Light and Power	1	7½	7½	34/-	—	4 8 3
Lond. Assoc. Electric	1	—	7	31/3xd	—	4 9 6
London Electric	1	7	8	35/6xd	—	4 10 2
London Power Deb. Red.	Stock	5	5	106½	—	4 14 0
Metropolitan	1	10	10	46/-xd	—	4 7 0
Midland Counties	1	7½	8	37/-	+6d.	4 6 8
Mid. Elec. Power	1	8	9	2	—	4 10 0
North Eastern Electric Ordinary	1	6	7	32/6	—	4 6 2
Do. 7% Pref.	1	7	7	34/6	—	4 1 2
Northampton	1	10	10	46/3xd	—	4 6 7
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	49/3	+6d.	4 1 2
Do. do. 6% Pref.	1	6	6	30/6	—	3 18 8
Scottish Power	1	8	8	37/-	—	4 6 8
South London	1	7	7	32/-	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/6	+6d.	6 7 8
Yorkshire Elec.	1	8	8	39/-xd	—	4 2 1
Public Boards.						
Central Electricity, 1950–70	Stock	5	5	113	—	4 8 6
Do. 1955–75	„	5	5	116	—	4 6 2
Do. 1951–73	„	4½	4½	109	—	4 2 7
Do. 1963–93	„	—	3½	97½	—	3 11 10
London Elec. Trans. Gtd.	„	—	2½	86	—	2 18 1
London & Home Counties, 1955–75	„	4½	4½	109	—	4 2 7
London Passenger Transport, A	„	—	4½	114½	−1	3 18 7
Do. do. B	„	—	5	117½	—	4 5 1
Do. do. C	„	4	4	82	—	4 17 6
West Midlands Joint Elec. 1948–68	„	—	5	111½	—	4 9 6
Telegraph and Telephone.						
American Tel. & Tel.	$160	9	9	171½	—	5 5 0
Anglo-Am. Tel. Pref.	Stock	6	6	122½	+½	4 18 0
Do. Def.	„	1½	1½	29½	—	5 1 8
Cable & Wireless 5½% Pref.	„	4½	5½	107	—	5 2 9
Do. Ord.	„	—	—	84	−2	—
Do. Income	„	—	—	101½	—	3 18 10
Globe Tel. & Tel. Ord.	10	4½*	5½*	16⅝	+½	3 6 3
Do. do. Pref.	10	6	6	14½	—	4 5 9
Great Northern Tel.	10	20	20	42½	+½	4 14 1
Marconi-Marine	1	10	7½	3/6	−1/16	4 0 0
Oriental Telephone Ord.	1	12*	12*	3½	—	3 16 10
Home and Foreign Trams, etc.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	21½	+2	—
British Electric Traction Def. Ord.	„	5	5	1275	—	—
Do. do. Pref. Ord.	„	8	8	168	—	4 15 5
Brazil Traction	$100	40 cts.	50 cts.	26½	−2	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	—	—
Do. 1st Bonds	$500	5	5	39½	−1	—
Victoria Falls Ord.	1	20	12	67/6	—	3 11 2
West Riding	1	6½	10	43/9	—	4 11 4
Manufacturing Companies.						
Aron Electricity Ord.	1	15	15	2½	—	6 0 0
Assoc. Elec. Ord.	1	8	10	49/6	—	4 0 8
Do. Pref.	1	8	8	37/6	—	4 5 3
Babcock & Wilcox	1	8	10	49/6	−6d.	4 0 9
British Aluminium Ord.	1	7½	10	54/-	−6d.	3 13 4
British Insulated Ord.	Stock	20	20	5	—	4 0 0
Brush Ord.	Stock	Nil	Nil	50½	+2	—
Callender's	1	15	15	4 3/16	—	3 2 3
Do. 6½% Pref.	1	6½	6½	30/-	—	4 6 8
Crompton Parkinson Ord.	5/-	12½	12½	3	+⅛	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	7	10	2½	—	4 14 1
Enfield Cable Ord.	1	25	25	5 1/16	—	4 8 0
English Electric	1	Nil	Nil	34/-	—	—
Do. do. Pref.	1	6½	6½	26/6	—	4 18 1
Ericsson Tel.	5/-	20	25	2⅞	+⅜	2 5 6
Ever Ready	5/-	35	45	32 9	−3d.	6 16 6
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	15	17½	86/-	—	4 1 4
Henley's	5/-	30	15	20/6	—	3 13 2
Do. 4½% Pref.	1	4½	4½	1½xd	—	4 0 0
India-Rubber Pref.	1	5½	5½	22/6	—	4 17 9
Johnson & Phillips	1	7½	10	47/-	—	4 5 1
Lancashire Dynamo	1	10	20	3 1/16	+¼	5 8 4
Siemens Ord.	1	6	7½	33/9	—	4 19 0
Telegraph Construction	£1	Nil	7½	2¾xd	—	2 17 2

* Dividends are paid free of Income Tax

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1935

28866. "Automatic frequency regulation of alternating-current supplies." General Electric Co., Ltd., and J. W. Gibson. October 18th, 1935. (469386.)

32339. "Electrical high-frequency signalling systems." E. C. Cork and J. L. Pawsey. November 21th, 1935. (Cognate application 16998/36.) (469245.)

1936

1104. "Emergency braking means for electric winders or the like." General Electric Co., Ltd., A. L. G. Lindley and R. M. Stephenson. January 13th, 1936. (469345.)

1565. "Telegraph keyboard transmitters." Creed & Co., Ltd., and A. E. Thompson. January 17th, 1936. (469106.)

1567. "Circuit arrangements for two-motion selector switches of so-called square type." Standard Telephones & Cables, Ltd., and E. P. G. Wright. January 17th, 1936. (469107.)

1666. "Electron-discharge apparatus." W. E. Williams. January 18th, 1936. (469111.)

1805 "Telephone systems." Automatic Electric Co., Ltd., R. Taylor and G. T. Baker. January 20th, 1936. (469184.)

1808. "Apparatus for receiving television and like electrical signals." General Electric Co., Ltd., and D. C. Espley. January 20th, 1936. (469394.)

1917. "Radio communication systems." Telephone Manufacturing Co., Ltd., and L. H. Paddle. January 21st, 1936. (Cognate application 18119/36.) (469444.)

1944. "Cones for loudspeakers." Hawley Products, Ltd., J. M. Butcher and G. R. Hosker. January 21st, 1936. (469445.)

1979. "Electrical connectors." Y. S. Caillau (née Brunel). January 22nd, 1936. (Cognate application 1618/37.) (469448.)

1996. "Sound-locating apparatus." P. W. Willans. January 22nd, 1936. (469322.)

2046. "Gas-filled electric-discharge devices." General Electric Co., Ltd. (Patent-Treuhand-Ges für Elektrische Glühlampen.) January 22nd, 1936. (Cognate application 188/37.) (469137.)

2207. "Electron-discharge apparatus." W. E. Williams. January 23rd, 1936. (469404.)

2277. "Photo-electric electron-discharge devices." Baird Television, Ltd., and E. B. King. January 24th, 1936. (469409.)

2280. "Method of producing electrodes having a large surface-area for use in electric accumulators." E. Langguth. January 24th, 1935. (469453.)

2287. "Electric-arc gap arrangements with electrodes adapted to operate in streaming extinguishing means." E. Marx and M. Gerlach. March 23rd, 1935. (469410.)

2307. "Arrangement and construction of electric ovens." J. Knatt, E. W. Rudd and Webb & Co. (Engineers), Ltd. January 24th, 1936. (469250.)

2322. "Operating mechanism for electric switchgear." British Thomson-Houston Co., Ltd., and H. E. Nicholson. January 24th, 1936. (469413.)

2341. "Apparatus for automatically controlling the current in an alternating-current circuit." A. H. B. Walker and Westinghouse Brake & Signal Co., Ltd. January 24th, 1936. (469414.)

2350. "Frequency-multiplying apparatus." Marconi's Wireless Telegraph Co., Ltd., and O. E. Keall. January 24th, 1936. (469416.)

2352. "Echo-sounding apparatus." Marconi's Wireless Telegraph Co., Ltd., and L. M. Myers. January 24th, 1936. (469417.)

2353/4. "Cathode-ray tubes." Marconi's Wireless Telegraph Co., Ltd., and G. F. Brett. January 24th, 1936. (469418/55.)

2356. "Cathode-ray tubes." Marconi's Wireless Telegraph Co., Ltd., G. F. Brett and G. B. Banks. January 24th, 1936. (469419.)

2357. "Cathode-ray tubes." Marconi's Wireless Telegraph Co., Ltd., and G. B. Banks. January 24th, 1936. (469420.)

2391. "Optical devices applicable for television and for other purposes." Scophony, Ltd., and J. H. Jefree. January 25th, 1936. (469426.)

2392. "Television and like systems." Scophony, Ltd., and J. H. Jefree. January 25th, 1936. (469427.)

2406. "Electric cookers." British Thomson-Houston Co., Ltd. January 25th, 1935. (469456.)

2409. "Wireless receivers." J. Robinson. January 25th, 1936. (469428.)

2413. "Cathode-ray tubes." C. S. Bull and F. H. Nicholl. January 25th, 1936. (469429.)

2700. "Electric cookers." General Electric Co., Ltd., and G. S. Cattell. January 29th, 1936. (469125.)

2809. "Method of producing television pictures by means of electric discharge tubes." E. Michaelis (E. Kinne). January 30th, 1936. (469127.)

2843. "Electric measuring instruments." Elliott Bros. (London), Ltd., and H. D. Hawkes. January 30th, 1936. (469460.)

4467. "Method of road-lighting from headlamps and other front lamps on motor-cars and like vehicles." J. H. Lupton. February 14th, 1936. (469254.)

4761. "Acoustic reproducers." D. W. S. Weeks, and Benjamin Electric, Ltd. February 17th, 1936. (469194.)

6303. "Electric insulators." British Thomson-Houston Co., Ltd. March 1st, 1935. (469340.)

7029. "Earth-leakage protective means for electrical apparatus." G. F. Chellis. March 9th, 1936. (469143.)

7183. "Loudspeakers." E. K. Cole, Ltd., and A. E. Falkus. March 10th, 1936. (469197.)

7385. "Distributors for magneto-electric machines." British Thomson-Houston Co., Ltd., and L. Griffiths. March 11th, 1936. (469260.)

9331. "Electric forging or upsetting machines." Austin Motor Co., Ltd., H. W. Walker and P. J. Blundell. March 30th, 1936. (469146.)

10200. "Combined electric coupling and fusible cut-out devices." Belling & Lee, Ltd., and A. G. Haslam. April 7th, 1936. (469264.)

11086. "Electric switches of the liquid-break explosion chamber type." British Thomson-Houston Co., Ltd. April 17th, 1935. (469266.)

11101. "Capacitor type single-phase induction motors." English Electric Co., Ltd., L. Roberts and R. D. Ball. April 17th, 1936. (469346.)

12519. "Electrical signalling systems." Ericsson Telephones, Ltd., and F. Limb. May 4th, 1936. (Cognate application 12520/36.) (469348.)

14441. "Apparatus for producing large impulses of electrical energy of short duration." Vertriebs-Ges. des Leipziger Leichtmetall-Werk. May 21st, 1936. (Addition to 432041.) (469275.)

15127. "Electric conductors with air-space insulation." Felten & Guilleaume Carlswerk Akt-Ges. May 28th, 1935. (469277.)

16262. "Electric dynamos or motors." H. S. Kozlowski. June 10th, 1936. (469436.)

16773. "Electric-discharge devices." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen.) June 16th, 1936. (469279.)

16785. "Safety arrangements for the drives of haulage and conveyor installations operated through the medium of controlled electric-discharge devices." Siemens-Schuckertwerke Akt.-Ges. August 20th, 1935. (469156.)

18948. "Electric arc rectifiers." British Thomson-Houston Co., Ltd. July 9th, 1935. (469281.)

21232. "Secondary emission electron-multipliers." General Electric Co., Ltd., and W. H. A. Aldous. July 31st, 1936. (469283.)

23615. "Electric cables and methods and apparatus for making them." United States Rubber Products, Inc. September 6th, 1935. (469213.)

23644. "Loudspeakers." Standard Telephones & Cables, Ltd. February 29th, 1936. (469286.)

23645. "Wave transmission systems and variable equalizers therefor." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). August 28th, 1936. (469214.)

25350. "Arrangements for connecting rotating members to their driving member in magneto-electric ignition apparatus." Fabrica Italiana Magneti Marelli. September 20th, 1935. (469288.)

25965. "Television and like receivers." General Electric Co., Ltd., and F. R. Jones. September 24th, 1936. (469289.)

26291. "Pressure gas electric switches." F. Strauss, (née Ruppel). September 26th, 1935. (Cognate application 26292/36). (469291.)

27275. "Signal amplifiers and repeaters." Marconi's Wireless Telegraph Co., Ltd. October 7th, 1935. (469295.)

28863. "Explosion-detectors." Standard Telephones & Cables, Ltd. (Matérial Telephonique Soc., Anon.) October 23rd, 1936. (469298.)

29822. "Electric switching devices operated by press-buttons." O. Aldinger. November 5th, 1935. (469353.)

30251. "Motor vehicle electric lamps." Butlers, Ltd., and A. Reeves. November 6th, 1936. (469355.)

31089. "Electrolytic refining of aluminium." Aluminium-Industrie Akt.-Ges., and H. Hurter. November 13th, 1936. (469361.)

31341. "Radio receiving sets." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 18th, 1935. (469163.)

32063. "Amplitude modulating circuit arrangements." Telefunken Ges. für Drahtlose Telegraphie. November 22nd, 1935. (469363.)

32070. "Sparking-plugs." H. J. Gabler. November 23rd, 1936. (469223.)

32439. "Combined electric switch and regulator actuating devices, particularly for radio." O. K. Ellinger and M. G. Geissler (trading as Ellinger and Geissler Fabrik Elektro-Technischer Bedarfsartikel). December 7th, 1935. (469364.)

33175. "Electric conductors and cables." H. Rost. December 18th, 1935. (Divided out of 16379/35). (469440.)

33313. "Radio antennæ particularly for television systems." Standard Telephones & Cables, Ltd. (Matérial Telephonique Soc., Anon.) December 4th, 1936. (469366.)

33606. "Electro-mechanical change-speed gear, more particularly intended for automobiles." P. Cibie. December 7th, 1935. (469166.)

1937

3332. "Automatic electric circuit-breakers." British Thomson-Houston Co., Ltd. February 4th, 1936. (469376.)

5866. "Vacuum cleaners." Electrolux, Ltd. March 16th, 1936. (469379.)

5938. "Selectivity adjustment arrangement for radio receivers." E. K. Cole, Ltd. July 4th, 1936. (469380.)

7673. "Supports for electric-discharge tubes." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen). March 16th, 1937. (469239.)

14891. "Electric heating apparatus for use in the surface-hardening of articles." F. S. Deneen and W. C. Dunn. December 14th, 1935. (Divided out of 29385/36.) (469383.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 11th.

Aristocrat. No. 575969. Class 13. Electric lamps (ordinary) and electric light fittings, all of ordinary metal, and all for use in street and public lighting.—The Walmsley Patent Lamp Co., Ltd., 180, Gray's Inn Road, W.C.1.

Transpex. No. 577282. Class 15. Glass. No. 577281. All goods in Class 17.—I.C.I. (Fertilisers and Synthetic Products), Ltd., Imperial Chemical House, Millbank, Westminster, S.W.1.

Hawkseye (lettering and design). No. 577669. Class 15. Reflectors of glass.—O. C. Hawkes, Ltd., Globe Works, Bromsgrove Street, Birmingham.

Astralon. No. 573586. Class 50. Rods, sheets, plates, tubes and bars made of vinyl-polmerisation products or of condensation products of phenols and aldehydes.—Dynamit Gesellschaft vormals Alfred Nobel & Co., Cologne, Germany. (British representatives: Marks & Clerk, 57 and 58, Lincoln's Inn Fields, W.C.2.)

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barnet.—Houses (36), Cowley Hill estate, Boreham Wood (£11,350); G. F. Newitt, builder, Farnham Lane, Farnham Royal, Buckinghamshire.

Bedminster.—Cinema, North Street; Cowlin & Sons, builders, Streetton Street, Bristol.

Berkshire.—Schools, Abingdon and Wargrave, and extensions, Hungerford School (£10,200), for County E.C.

Billingham-on-Tees.—Houses (40), Port Clarence; Kitching and Co., architects, 21, Albert Road, Middlesbrough.

Blackpool.—Confectionery factory, Stanmore Avenue, Marton, for W. G. Ellis, 6, Carleton Road, St. Annes-on-Sea; N. Ramsbottom, architect, Dickson Chambers, 7 and 9, Dickson Road, Blackpool.

Boldon (Co. DURHAM).—Houses (71); N. Hindmarsh, U.D.C. surveyor, Council Offices, Boldon.

Bolton.—Cinema, Derby Street, for A. Hall, South Shore, Blackpool; J. W. Lee, Ltd., Yarrow Road, Chorley.

Bournemouth.—Isolation hospital, West Howe; borough engineer. Extensions to Toft Hotel, Manor Road; Solent Hotels, Ltd.

Bromsgrove.—Houses (54); R. H. Davies, Yard Lane, Alvechurch.

Burnley.—Extensions to works, for Hortus Printing Co., Junction Street; Aspden & Johnson, architects, 104, Manchester Road.

Cardiganshire.—Alterations, &c., to County school, Llandyssul (£12,479), for County E.C.; Davies & Davies, builders, Llandyssul.

Chesterfield.—Houses, Hady Hill estate; W. F. Weldon, builder, 71, Old Park Road, Sheffield.

Crawley.—Cinema, High Street; Reigate Theatres, Ltd., Reigate.

Crewe.—Aerodrome (£62,000); borough engineer.

Darlington.—Houses (240); borough engineer. Hotel, Blackwell (£50,000), for Edlington Hotels, Ltd.; E. M. Lawson, architect, Barras Buildings, Newcastle-on-Tyne, 2.

Dartford.—Houses (48), James Road; A. Packer.

Darton (BARNSLEY).—Houses (32), Higham Common Road, Higham; assistant surveyor, Council Offices, Darton.

Deal (KENT).—Reconstruction of business store, for Clarabut, Ltd.; G. Baines & Son, architects, 121, Victoria Street, Westminster, London, S.W.1.

Dewsbury.—Extensions to premises; S. Lyles, Sons & Co., Ltd., Earlsheaton.

Doncaster.—Cinema, Balby, for the Suburban Cinemas (North Midlands), Ltd. Completion of school for the deaf (£50,000), for the Governors of the Yorkshire Institution for the Deaf; S. Nettleton, secretary.

East Ham.—Offices and clinics (£35,729); borough engineer.

Edinburgh.—Houses (240), Colinton Mains, for Mactaggart and Michel; Stewart Kaye, 14, Hill Street, Edinburgh, 2. Building, Marchhall Crescent, for the Royal Edinburgh Hospital for Mental and Nervous Disorders; the superintendent.

Elland (YORKSHIRE).—Cinema, Box Hall, fronting on Victoria Road, for the Central Pictures (Elland), Ltd.; J. Montgomery, manager.

Friern Barnet.—Houses (60), Grange estate; L. T. Swanne.

Gatley.—Cinema and shops, Northenden Road; W. W. Stansby.

Glasgow.—Reconstruction of Regent Cinema, Renfield Street; R. A. Bryden, Robertson & Boyd, architects, 147, Bath Street, Glasgow, C.2.

Gloucestershire.—School, Downend, near Mangotsfield, for County E.C.

Gosforth (NORTHUMBERLAND). — House, Coxlodge Hall grounds; A. Woolf, builder, Fernville Road.

Great Yarmouth.—Six shops, King Street; Townsend Estates, Ltd. School, Caister Road, for E.C.

Gwyrfai (CAERNARVON).—Houses (270), various parishes; D. H. Roberts, R.D.C. surveyor, 22, Castle Square, Caernarvon.

Hampshire.—Extensions to Tatchfield Colony (£50,000); county architect.

Hanley.—Offices and shops, Stafford Street; Cardigan Estates, Ltd.

Hemsworth (PONTEFRACT).—Houses (90), Tombridge Crescent, No. 2 estate, near Wakefield Road, Kingsley; A. Wright, Clerk of the Council, White Hall, Hemsworth.

Hertford.—Houses (51); Seymour Bros. and Tookey, and B. & G. Mott, builders, Hertford.

Huddersfield.—Houses (987), Bracken Hall estate; town clerk, Town Hall, Huddersfield.

Ipswich.—Schools; Johns & Slater, architects, 3, Lower Brook Street.

Irish Free State.—(DUNGARVAN, CO. WATERFORD).—Houses; D. S. Doyle, 45, Parnell Street, Clonmel, Co. Tipperary.

Isle of Axholme (DONCASTER).—Houses, Belton and Westwoodside; Green & Mackender, builders, Ashby, Scunthorpe.

Kidderminster.—Offices for the Steel Stampings, Ltd., Cookley; Pritchard Godwin & Clist, architects, Bank Chambers, Kidderminster.

Kirkintilloch.—Houses (30), Greens Farm; J. Coates, burgh surveyor, Council Chambers, Kirkintilloch.

Lancashire.—Modernisation of County police stations (£40,500); county architect.

Leeds.—Bus station (£13,442); city engineer.

Lerwick.—Hospital buildings, Gilbert Bain Memorial Hospital; J. Miller, 15, Blythswood Square, Glasgow, C.2.

Llanelly.—Cinema, Station Road, for the Odeon Cinema Holdings, Ltd.; H. W. Weedon, architect, 84, Colmore Row, Birmingham.

London.—(E.C.1).—Factory, City Road (£40,000), for the United Drug Co., Ltd.; George Parker & Sons, Ltd., builders, 124, Sumner Road, S.E.15. (LAMBETH).—Three blocks of five-storey dwellings, Hemans Street; borough engineer, Lambeth Town Hall, Brixton Hill, S.W.2.

Long Benton (NORTHUMBERLAND).—Cinema, Wideopen; Marshall, Tweedy & Bourn, architects, Mervyn House, Newcastle. School, Forest Hall (£24,740); A. Anderson, Ltd.

Manchester.—Factory, &c., Lloyd Road, Levenshulme, for Armstrong-Siddeley Motors, Ltd.; A. Cassell & Sons, Ltd., Great Cheetham Street, Higher Broughton. Omnibus garage, Belle Vue Street, Gorton (£12,500); G. Noel Hill, city architect.

Middlesbrough.—Theatre, Eastbourne Road; Kitching & Co., architects, 21, Albert Road.

Newcastle-on-Tyne.—Works, Portland Road, for J. Dampney & Co.; T. A. Page, Son & Bradbury, architects, King Street, South Shields.

Northampton.—Houses (134); borough engineer, Guildhall.

Northern Ireland.—(BELFAST).—Offices and workshops (£80,000), for the Belfast City and District Water Commissioners; Silcock & Thearle, architects, Rodney Street, Liverpool.

North Kesteven.—Houses (123), various parishes; J. Chadwick, R.D.C. surveyor, 25, Clasketgate, Lincoln.

Oxford.—Houses, Rose Hill No. 2 estate, and Barton No. 2 estate; A. Carstairs, city surveyor, Town Hall, Oxford.

Poynton (STOCKPORT).—Houses (30), Lower Park Road; P. Clayton & Son.

Prestonpans.—Houses (54), Back Road site, with electrical work; R. and A. K. Smith, surveyors, 4, Forres Street, Edinburgh, 3.

Ratby (LEICESTERSHIRE).—Extensions to cinema; G. Weston.

Redcar.—Public library, Coatham Street; G. T. Howd, builder, Middlesbrough.

Reddish.—County Cinema, for Jackson & Newport, Ltd.; Roberts, Wood & Elder, architects.

Renfrew.—Factory and offices for the Scottish Cable Co., Ltd.; J. Taylor Thomson, architect, Bath Street, Glasgow.

Rotherham.—Extensions to works, Grange Mill Lane; British Acheson Electrodes, Ltd.

Rugby.—Houses, Gloxam Garden, Bilton Road; W. H. Adams & Sons, 25a, Regent Street.

Sheffield.—Houses and garages, &c., Foxwood estate; Hallwell Estates, Ltd., 134, Ridgehill Avenue. Cinema and shops, Norfolk Street and Flat Street, for the Odeon (Sheffield), Ltd., Bennett's Hill, Birmingham.

Sidmouth (EXETER).—Hotel, Lower Woolcombe, for G. Vallance; R. W. Sampson, architect, Fortfield Chambers, Sidmouth.

Somerset.—Police courts, and alterations to existing police station, Axbridge, for the Standing Joint Committee; A. J. Toomer, county architect, Park Street, Taunton.

Southampton.—Cinema, High Road, Swaythling, for the Palladium, Southampton, Ltd.

Stafford.—Houses (26), Tillington estate and South Walls; W. Plant, borough engineer, Borough Hall, Stafford.

Staffordshire.—School, Mullett Road, Wednesfield, for County E.C.; G. C. Lowbridge, education architect, County Buildings, Stafford.

Stirling.—Nurses' home (£50,000) and houses for attendants for the Joint Committee of Stirling District Mental Hospital; medical superintendent.

Stockton-on-Tees.—Houses (260); borough engineer.

Stoke-on-Trent.—Houses (22), Sandhurst Avenue; Hillside Estate Co., Ltd. School, Chell (£40,500), for E.C.

Stretford.—Five shops and flats, Barton Road; J. Maunder & Sons.

Sunbury-on-Thames.—Cinema and shops, Riverside Gardens; David Stokes, architect, 11, Great Russell Street, London, W.C.1.

Sussex.—Farm school, Kingsham (£40,000), for West Sussex C.C.

Teignmouth.—Houses (50), adjoining Mill Lane; E. Gardner Thorp, U.D.C., surveyor, Council Offices, Bitton House, Teignmouth.

Thornaby-on-Tees.—Factory for the Saturn Oxygen Co.

Todmorden.—Houses (130), Carr House and Walsden; H. Crabtree, borough surveyor.

Urmston.—Houses, Canterbury Road, Dorchester Road and Moss Vale Crescent; A. Locke, Ltd., builders, Lostock Road.

Uttoxeter.—Cinema for the Union Cinema Co.

Wakefield.—Houses, Crigglestone, Sharlston and Crofton; R.D.C. surveyor.

Warrington.—School, Grappenhall Road, Latchford, for E.C.; borough surveyor, Town Hall, Warrington.

Warwickshire.—School, Stratford-on-Avon (£49,560), for County E.C.

Washington (NEWCASTLE-ON-TYNE).—Extensions to works (£25,000), for Washington Chemical Co., Low Fell and Washington.

Wembley.—Maternity and Child Welfare Clinic, Stag Lane, Kingsbury; treasurer and accountant of the Council, 117a, High Road.

West Hartlepool.—Houses, Easington Road and Raby Road; borough engineer.

Weymouth.—Extensions to Torpedo works, Wyke Regis; Whitehead Torpedo Co.

Whitby.—Stores, &c., Wellington Road, for the Whitby Co-operative Society; C.W.S. Architects' department, 90, Westmorland Road, Newcastle-on-Tyne.

Widnes.—Health clinic, Kingsway (£14,460); Atlas Building & Construction Co., Wilderspool Causeway, Warrington.

Worcestershire.—School, Stourport, for County E.C.

Yiewsley.—Houses (120), Bell Farm estate, West Drayton; W. T. Morgan, engineer, Council Offices, Yiewsley.

Yorkshire.—Extensions to Grammar school, for West Riding C.C.; Education Officer, County Hall, Wakefield.